VALUABLE

SECRETS

IN

ARTS, TRADES, &c.

SELECTED FROM THE BEST AUTHORS,

AND

ADAPTED

TO THE SITUATION OF THE

UNITED STATES.

Hæ tibi erunt ARTES! VIRG.

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DISTRICT OF NEW-YORK, ss. Be it Remembered, that on the fifth day of October, in the thirty-fourth year of the Independence of the United States of America, Evert L. S. Duyckinck, of the said District, hath deposited in this office the title of a Book, the right whereof he claims as Proprietor, in the words following, to wit:

"Valuable Secrets in Arts, Trades, &c. selected from the best "authors, and adapted to the situation of the United States.
"Hæ tibi erunt Artes!—Virg."

In conformity to the Act of the Congress of the United States, entitled, "An act for the encouragement of learning, by securing "the copies of Maps, Charts and Books, to the authors and pro- "prietors, of such copies, during the time therein mentioned, and "also to an act entitled an act supplementary to an act entitled an "act for the encouragement of learning by securing the copies of "Maps, Charts and Books, to the authors and proprietors of such "copies, during the time therein mentioned, and extending the "benefits thereof to the arts of designing, engraving and etching "historical and other prints."

CHARLES CLINTON.
Clerk of the District of New-York.

THE EDITOR'S PREFACE.

THE Arts cannot attain a higher degree of perfection till more exact enquiries are made concerning every thing which can contribute towards facilitating their progress. It ought, therefore, to be the study of every individual to diffuse his observations, and extend his researches in a country where he can claim a liberal encouragement for new discoveries; and where every work which tends to the promulgation of arts in general, meets with ample reward.

Among those friends of the sciences who discharge their duty in the most becoming manner, the American artists, and professed mechanics, are, undoubedly entitled to the first rank,as their experiments and productions are of evident, and real utility to their country.

It is but of a late date since those arts and trades which constitute the wealth and commerce of the European Nations, began to receive the encouragement and support of the citizens of the United States, and to increase their lustre, their œconomical order, and their regular and necessary distribution in this rising empire.

The present work is a faithful compilation of various secrets in the refined arts and trades; discoveries no way unworthy the attention of Americans.

The art of Engraving, yet in its infant state here, will, if not very materially benefited, at least be settled upon a more permanent basis,by a due observation of the directions and receipts contained in this volume.

The various combinations and compositions of metals; the art of Varnishing, of making mastiches and cementations: curiosities in glass and precious stones; the mixture of colours in painting; the art of gilding; dying wood, ivory, &c though seemingly of little importance at the first view, will be found useful if not absolutely necessary, towards facilitating the progress of those arts in the United States,

where it is hoped that taste and elegance will claim a proportionable share of the public's attention and encouragement.

Other matters are added, useful to those who wish to be easily accommodated with the polite and useful necessaries of a frugal life. They are intended chiefly for those who have had few opportunities to learn the proper methods of making the best use in art, of those things which nature profusely lavishes for the promotion and increase of domestic felicity.

Many of the following secrets and receipts are derived from the works of the first artists in France, Italy, Germany, and Great-Britain ; and the labours of several eminent artists here have given great assistance towards rendering them easily to be understood by the most common capacity, and more extensively useful to the infant manufactories of the United States.

That the work might not be altogether uninteresting to that great portion of the people of the United States which constitute the agricultural part, many and valuable essays on agriculture, rusal and domestic economy are added, chiefly selected from American works of known and acknowledged estimation and value.

In the confidence that the American public will always be ready to give proper encouragement and support to every work intended to promote the true interest and lasting good of the United States, this work is, without further preface, submitted to his fellow-citizens, by THE EDITOR.

SECRETS

IN

ARTS, TRADES, &c.

CHAP. I.

SECRETS RELATIVE TO THE ART OF ENGRAVING.

I. *A wax to lay on iron or steel.*

TAKE the bulk of a nut of white wax, melt it, and add to it the size of a musket ball of ceruse of *Venice*.—When both are incorporated, form this composition into small sticks. With them rub your piece of steel, or iron, after having previously warmed it sufficiently to melt the wax, which spread well over it with a feather. When the wax is cold, trace whatever you will on it, and pass afterwards, on the lines you have drawn, the following water.

II. *A mordant water to engrave on steel.*

1. Take the strongest verjuice you can find; alum in powder, and a little dried salt, pulverised. Mix all together till perfectly disolved: then pass some of that water on the lines of your drawing, repeating the same till it is sufficiently deep engraved.

2 Or else take verdigrease, strong vinegar, ammoniac and common salts, and copperas, equal parts. Set all together a boiling for a quarter of an hour; then strain it through a rag, and run some of that water on your plate. In about half an hour afterwards it will be perfectly engraved.

3. CALLOT's varnish, of which the composition shall be found hereafter, in the *Chapter on Varnishes*, is an admirable composition to lay on the plate you propose to engrave.

III. *To engrave with aquafortis, so that the work may appear like a basso relievo.*

Take equal parts of vermillion and black lead, two or three grains of mastich, in drops. Grind them all together, on marble, with lintseed oil; then put this composition into a shell. Next to this operation, cut some soft quills, and let your steel or iron be well polished. Try first whether your colour runs sufficiently with your pens; and if it should not, you must add a little more oil to it, so as to have your pen mark freely with it, as if you were writing with ink on paper. Then rub well your plate of steel with wood ashes, to clean and ungrease it; after which wipe it with a clean rag, and draw your design upon it with your pen, prepared as before, and dipped into your liquor. If you want to draw birds, or other animals, you must only draw the outlines of them with your pen, then fill up the inside of those lines with a hair pencil; that is to say, you will cover all the space contained between the first outlines drawn with the pen, the same colour, which you will lay with a brush to preserve all that part against the mordacity of the aquafortis. When that is done, let your work dry for a day or two; and when dried, take some fire made with charcoal into a chafing dish, and bake over it your colour by degrees till it becomes quite brown. Take care notwithstanding not to burn it, for fear you should scale it when you come to scratch, with the point of a needle, those etchings, or places, which you want to be engraved with the following aquafortis.

IV. *Aquafortis for engraving.*

Take verdigrease, roch alum, Roman vitriol, and common salt of each three ounces; pound it into a very fine powder. Have a new pipkin, put a little more than a quart of water, and your drugs, all together. Let them thus infuse a couple of hours; then place them over a charcoal, fire and when the water has a little simmered, take the pot from off the fire and let it cool, that you may dip your hand in without scalding. Then have an earthern cup, with which you take off that water, and pour it over the work you mean to engrave; so that it may run freely over all the places which are to be marked, and then off into a pan placed under to receive it. Continue thus to water your works for three quarters of an hour. Then you will pour upon it clear pump water, to wash off the mud which the aquafortis shall have occasioned. You are then to try with a nee-

dle the depth of the lines of your engraving and, if not at your liking, you must begin again watering it as before. The only care you are to have is, that your liquor should not be too warm; for then it would spoil the work. It is better to use it lukewarm only, and be longer at it.

V. *To engrave on brass, or copper, with aquafortis.*

You must put in your colour more mastich in drops, and bake it also rather more over the fire after it is laid on your plate, so that it should almost turn black. And if it be a flat work, as generally are all those on copper plates, you must raise around it a border of wax to prevent the aquafortis, which you are to pour on it, from running off, and which is to be a separating aquafortis, with which you cover the plate to the thickness of a crown piece. After it has been thus left covered with that aquafortis for a little while, this becomes green; then is the time to throw it away, and to pour in its place some pump water; when you will examine whether the lines be sufficiently deep or not. If not, pour again fresh aquafortis on your plate, and thus you obtain your works of basso-relievo by contrary: that is to say raised grounds. You may thus engrave all sorts of works.

VI. *To engrave prints by aquafortis.*

Take some ceruse; grind it well with clear pump water, and size it with isinglass. Lay this composition with a coarse brush, or pencil, on the plate which you want to engrave When it is dry, draw on it whatever design you please Or, if you want to counterproof a copper-plate print, blacken all the back of your print, and placing that blackened part on your plate, prepared as before, go over all the strokes of your print, with a smooth ivory or wooden point, which will stamp the black of the print, in all those places, on the plate. Then you will go again over all the black strokes which are laid on your plate, with a pen and ink; and taking afterwards a steel point, very fine and well tempered, you will etch your plate with it, in following all the strokes marked on it, and pour aquafortis, as before directed.

VII. *The method of engraving with aquafortis.*

1. You must have a very well polished plate, and perfectly clean. Set it to warm over a chafing dish, in which there is a charcoal fire. While on it cover it with a varnish,

either dry or liquid, for there are two sorts. Then you blacken that varnish with the flame of a candle, over which you pass and repass the plate on the varnished side

2. This being done, you have no more to do than to chalk your design on that plate, which is infinitely more easy than to engrave with the graver. For if you rub the back part of your drawing with some sanguine stone (red chalk) or any thing else, and lay it afterwards on your plate, to trace it with a point, the sanguine which is on the back of the draught will easily set off on the varnish. So that you may follow afterwards all the lines of the design, and be infinitely more correct in all the turns, and the expression of the figures. This is the reason why all the painters who have their own works engraved, take the trouble of drawing also the outlines of their figures, that the spirit and beauty of the design may be preserved. Indeed it must be confessed, that we always discover a great deal more art in those pieces which are engraved with aquafortis, than there is found in them that are done by the graver. And, even in many of these, the aquafortis is often employed to sketch lightly the *contours*, or outlines of the figures, and to have them more correct

3. True it is, that it is sometimes found necessary to touch a little over with the graver, certain parts which are not strong enough, or that the aquafortis has not eaten in sufficiently. For it is not easy, in a great plate, to get all the several parts so proportionably, and *a propos*, eaten in, as there should be nothing to find fault with.

4. It is not enough for an engraver to work with the point of his needle, or scooper, in all the different places of his work, with the strength and delicacy necessary to make appear, as he wants them to be, the most remote and nearest parts It is again requisite that he should take care, when he comes to put the aquafortis on his plate, it should not bite equally every where. This is prevented as follows, by a mixture of oil and tallow, which you will drop into it from a lighted candle

5. To this effect he must have a framed wooden board, overlaid with wax, on which he fixes his plate a little slant way, then pours aquafortis on it, so that it may only pass over it, and run into an earthen pan, placed under to receive it. Therefore he takes care to examine when those parts, which are not to be so deeply eaten in, have received a sufficient quantity of aquafortis; in which case, taking off his plate, he washes it with pump water, by pouring it only over, dries it gently before the fire, then covers the most remote parts, and them which he wants to preserve weakest, with the abovementioned mixture of oil and tallow, that the aquafortis should not act any more on those places.—

Thus, covering at several times, and as much as he pleases, such places of his plate as he wants to keep not so strong as others, it results that the figures which are forwards in the picture, are constantly every time washed with the aquafortis which eats in them, till he sees they are sufficiently engraved, and according to the degree of strength which he is desirous of giving them.

6. That sort of aquafortis we have mentioned and described in this chapter, at the article of the *water for engraving on iron*, and which is composed with verdigrease, vinegar, common and ammoniac salts and copperas, is also made use of to engrave on copper, in pouring it on the plates, covered either with hard or soft varnish, and scratched, or etched, agreeably to the design you intend to engrave on them.

7. As for what concerns the refiner's aquafortis, commonly called *white water*, it is never used but upon the soft varnish, and never as the former, which is called *green water*, by pouring it only over the plate, and letting it run off into a pan under it. A border of wax must be made round the plate, on which this being laid flat upon a table, some of that *white water* is poured, after having previously tempered it more or less with a proportionable quantity of common water, which is called *pickling*.

VIII. *To engrave on wood.*

You begin by preparing a board, according to the size and thickness you want it, and finely polished on the side it is to be engraved. The sort of wood which is generally chosen for such a purpose, is either pear tree or box. And of the two, this last is even still preferable, both on account of its being of a superior hardness, and also less liable to be worm eaten. On that board you draw first your design, such as you want it to appear in printing. They who have not the talent of drawing, as there are a great number who make use of the very drawing you give them, which they paste on their board, by their right side, with a paste made of good flour, water, and a little vinegar. You must take care that all the strokes of the drawing should touch well, and stick on the wood; and when the paper is very dry, wet it gently, and with the tip of your finger rub it off by degrees, so that the strokes only of the drawing should remain on your board, as if you had drawn it with ink and a pen. These strokes or lines shew all that you are to spare or preserve; all the rest you are to cut off and sink down with delicacy, by means of a sharp and well tempered penknife, small

chissel, or *gouet*, according to the size and delicacy of the work, for you have no need of any other tool.

IX. *To engrave on copper with the graver.*

1. When the plate, which is to be of red copper, is well polished, you draw your design on it with either the black lead stone or a steel point. When that is done you have no further need of any thing but a sharp and well tempered graver to cut in, and give more or less strength to certain parts, according to the subject, and the fine figures you execute.

2 You must also have a certain tool of six inches long, or thereabouts, one of the ends of which, called a scraper, is made in the form of a triangle, sharp on each edge, with which you scrape on the copper when you want it. The other end called a burnisher, has very much the shape of a fowl's heart, a little prolonged by the point, round and slender. This serves to polish the copper, to mend the faults, and soften the strokes.

3. In order to form a better judgment of your work, you must now and then as you proceed on, make use of a stump made with the piece of an old hat rolled up and blackened, with which you rub your plate, on the place you are working, which fills the strokes with black, and makes you see better the effect of your work as you go. You must be provided likewise with a leather cushion, on which you lay your plate while you engrave it.

CHAP. II.

SECRETS RELATIVE TO METALS.

1. *Transmutation of iron into the finest German steel.*

1 TAKE clean soot one pound; oak wood ashes twelve ounces, and four of pounded garlics. Boil all together in twelve pounds of common water, reduced to four pounds. Strain this, and dip in it the iron pegs, which you will afterwards stratify with the following cement.

2. Take burnt wood coals, otherwise called *cokes*, and quick lime, of each three pounds; soot dried, and calcinated in an iron pan, one pound; decripitate salt four ounces. Make of this and your iron several beds alternately, one over another; and having well luted the vessel in which you shall have made those beds of iron and cement, give them a reverberating fire, for three times twenty-four hours, and the operation is done.

II. *To refine Pewter.*

Take fine Pewter, melt it in a crucible. When done, project over it at several times some nitre till you see it calcined. Then pound it into powder, and mix it with an equal quantity of charcoal pulverized very fine. If in this condition you melt it again, it will resume its form of pewter, only refined in a much superior degree.

III. *Method of tempering edge-tools that are of too brittle a quality.*

Plunge them in boiling fat for two hours then take them out, and let them cool gradually. They will retain their hardness without being brittle.

IV. *To make Pewter.*

Melt together 1 cwt. Tin, 15 lb Lead, and 6 lb. Brass, the whole forms what is called pewter.

V. *To make pinchbeck.*

Melt one pound of zinc, with five or six pounds of cop-

per; the purer these metals, the more malleable the pinchbeck. Its colour much resembles gold.

VI. *On Zinc, or spelter, and its various uses.*

Zinc combined with gold in equal proportions forms a hard white compound metal, that admits of a fine polish, and may be advantageously manufactured into specula for optical instruments.

Zinc and Tin melted together form a kind of pewter.

Spelter and copper readily unite in the fire, provided the combustion of the former be carefully prevented during the process. In this state, it forms a metal distinguished by the name of yellow copper; but which is divided into several sorts according to the respective proportions contained in the alloy. Thus three parts of copper and one of zinc, constitute brass; five or six of copper and one of zinc, form pinchbeck: Tembac is composed of a still larger proportion of copper than pinchbeck, is of a deeper red, and bears the name of its inventor. Princes metal requires a still larger proportion of zinc than either of the preceeding compositions.

VII. *To make blue letters on polished sword blades.*

Take a well polished sword blade, and hold it over a charcoal fire till it is blue. then with oil colour write such letters, (or make such figures) as you wish should appear, and remain, and let them dry; then warm some strong vinegar, and pour all over the blade, which will infalliably take off the blue colour. After this process, a little common warm water will take off the oil colour, and the letters or figures will appear and remain of a curious and indeliable blue, the same may be done on any polished steel.

VIII. *Method of giving a lustre to Silver.*

Dissolve a quantity of alum in water, so as to make a pretty strong brine, which you must scum very carefully; add some soap to it, and when you want to use it, dip a piece of linen rag in it, and daub it over your pieces of plate. This process will add much to their lustre.

IX. *To extract Mercury from Lead.*

Take lead filings one pound; ammoniac salt four ounces; bricks pounded into a powder, three pounds. Distil this composition in a retort, on a gradual fire. The receiver must be very large, half full of water, and the fire

must be continued for twelve hours, pushing it by degrees, to the very last.

X. *To preserve the brightness of arms.*

Rub them with hart's marrow. Or else, dissolve some alum powder with the strongest vinegar you can find, (that of *Montpellier*, which serves to make their famous verdigrease, is the fittest) and rub your arms with it. By these means, they keep for ever bright and shining.

XI. *To operate the transmutation of iron into steel.*

Take beech and willow, burn them together. When in coals, extinguish them, before they are consumed, with water, or rather, with chamber-lye. Pound them well and sift them through a very fine sieve. Then burn likewise ox horns, and prepare them the same way. Sift well also soot, vine ashes, burnt shoe ashes, and pomegranate, shell powder, putting aside and separating each drug by itself, and mix them afterwards, when used, in the following proportions. Coals twelve pounds; horns ten: shoes, vine soot, and pomegranate, of each equal quantities three pounds, all well mixed together. To make *one hundred* pounds weight of steel, there is required *one hundred and twenty pounds* weight of good, soft Spanish iron not streaky; to which if you give the aforementioned dose of the said powders, prepared as directed, and put to the fire, for the space of forty-eight hours, you will get the best steel which can be had.

XII. *Another receipt for the Same.*

1. Take one bushel of beech coals pulverised and sifted alder's coals, thus prepared, one peck; vine ashes and soot, both well pulverised and sifted, equal parts, half a peck. Mix well these powders, and stratify your iron bars with them in a crucible well luted; then give a good fire for twenty-four hours.

N. B. Observe that you must take care to use new, and not floted wood to make the said ashes.

2. If you want to have your steel white, you must add to all the above powders one peck of juniper wood ashes.

3. If you want it purple you must make a lexiviation of vine and shoe ashes, soot and garlic, well pounded, equal parts; and a sufficient quantity of water to make the said bullitorium, in which you will steep, cold, your iron bars before you cement them.

4. You must proportionate the quantity of wind holes, in

each kiln, to the quantity of bars, and of crucibles, for which you intend to fit it.

5. The *stratum super stratum* ought to be made an inch, or an inch and a half inch thick of powder to each bed. The bars ought to be ranged cross way one over another; and large crucibles are to be preferred to small ones. You must take care to have them so well luted, as not to allow the least air to find its way in; for there would result an intire miscarriage of the whole operation; and besides, your powder would hence lose all its virtue — Should you likewise let it get air before you make use of it, it would become quite dead and flat. Therefore, you are cautioned to keep it always very closely confined in well stopped vessels, of whatever kind they may be. That which comes off from the crucible, after the operation, is not worse for having been thus in use It wants therefore, nothing but an additional supply of fresh powder joined to it, to make up what is lost or diminished, by the frequent handling of it, in taking it out, and putting it in the crucibles again.

6. The kiln ought to be wide by the inferior part, and go narrowly towards the top, which must end in a conical form. By such means the heat contracted becomes strong, and acts with infinitely more power. Neither must you neglect to have it so constructed as to be provided with an ash-hole, or a place underneath wherein the ashes may fall, and several openings to let the wind escape.

XIII. *To give iron a temper to cut porphyry.*

Make your iron red hot, and plunge it in distilled water from nettles, acanthus, *and pilosella*, (or mouse ears) or in the very juice pounded out of these plants.

XIV. *To soften all sorts of metals.*

Take sublimated mercury, euphorbium, borax, and ammoniac salt of each equal parts pulverised. Project some of that powder over any metal, when in a state of fusion, and you will obtain the desired effect of making it soft.

XV. *A very hard temper for arms.*

Take nettle juice, bullock's gall, child's water or strong vinegar, and a little salt. Incorporate well all this together, and plunge any red-hot iron in it.

XVI. *Ingredients which serve to the melting of iron.*

Iron is to be melted with any of the following ingredients; *viz* pewter, lead, marcasite, magnesia, auripigment, antimony, crown glass, sulphur, ammoniac salt, citrine miribolans, green, or fresh pomegranate rinds, &c. &c.

XVII. *Another method to refine pewter.*

Take fine pewter, and put it into a crucible When melted project over it, at different times, some nitre, till it comes to a perfect calcination. Repeat this three times, pounding the matter into powder, which mix with charcoal dust. Being thus melted, it will resume its former substance of pewter, with this difference, that it will be refined to an infinitely superior degree.

XVIII. *To fix Mercury.*

Take verdigrease, in powder, which put in a crucible. Make a hole in that powder and place in it a knot of mercury previously impregnated with white of eggs water. Cover this knot over with borax, and add again over this some more verdigrease and pounded glass, one or two finger's deep. Lute well the lid of the crucible, and give a pretty smart fire, though gradually and not at once, for the space of two hours.

XIX. *To extract mercury from lead.*

Take lead and beat it into sheets, or laminas, very fine. Put these in a glass vessel with common salts, a double quantity of the lead. Cover this well, and bury it under ground for nine days at least. After that time, if you open the vessel again, you will find your lead turned all into running mercury, or quicksilver at the bottom of it.

XX. *The composition of metalic mirrors, or looking glasses, used among the ancients.*

1. Take one pound of decapitated, or well purified copper, which melt, then throw over it three pounds of refined pewter. As soon as they shall be both in good fusion, add six ounces of calcinated red tartar, two of arsenic, half an ounce of salt-petre, and two drachms of alum. Leave all this infusion together for the space of three or

four hours that all the salts may well evaporate, then cast this composition in the flat sand mould, prepared for it.

2. To give these mirrors the requisite polish, proceed as follows. Take the coarsest part away with the wheel over a grinding stone, the same method as the pewterers and braziers do, and then smooth them with water till they are sufficiently polished by attrition. Take the mirror from that, wheel, and put it on the wooden one covered with leather, after having rubbed it well with emery, to give it a fine polish, then take it again from this wheel, and put it on another of the same kind, covered with leather, after having previously rubbed your mirror with prepared blood stone, and washing it afterwards with magister of pewter. Take notice to make your mirrors observe on both the last leathered wheels, the same oblique direction in turning them, and continue so long till the mirror has acquired a sufficient fineness and brightness.

Convex and ardent mirrors are rubbed and polished in the same manner.

XXI. *To give tools such a temper as will enable them to saw marble.*

Make the tool red hot in the fire, and when red cherry colour, take it off from the fire, rub it with a piece of candle, and steep it immediately in good strong vinegar, in which you shall have diluted some soot.

XXII. *To soften iron, and harden it afterwards more than it was before.*

1 Make a little chink lengthways in an iron bar, in which pour melted lead. Then make it evaporate by a strong fire, as that for copelling. Renew this operation four or five times, and the bar will become very soft. You harden it afterwards in steeping it, when red hot, in mere forge water, and it will be of so good a temper, as to be fit for lancets, and razors and knives, with which you will be able to cut other iron, without its splitting or denting.

2 It has been found by experience that an armour can never be good proof against fire arms, if it has not first been softened with oils, gums, wax and other incerative things and afterwards hardened by steeping them several times over in binding waters.

XXIII. *The transmutation of iron into damask steel.*

You must first purge it of its usual brittleness; and after having reduced it into filings, make it red hot in a crucible; steep it several times in oil of olives, in which you shall have before thrown several times melted lead. Take care to cover the vessel in which the oil is contained, every time you throw your steel into it, for fear the oil should catch fire.

XXIV. *To guard iron against rusting.*

Warm your iron till you can no more touch it without burning yourself. Then rub it with new and clean white wax. Put it again to the fire, till it has soaked in the wax. When done, rub it over with a piece of serge, and this iron will never rust.

XXV. *To cut pebbles with ease.*

Boil it a good while in some mutton suet, and then you will cut it very easily.

XXVI. *A projection on copper.*

1. Take fine pewter two ounces, which you melt in a crucible. When melted, throw in it by little at a time the same weight of flour of brimstone. Stir every time with a rod, till you see both your pewter and sulphur well calcinated. Then take the crucible out of the fire, and throw in half an ounce of crude mercury. Let it cool, and pulverise this.

2. Now melt four ounces of molton copper. When in good fusion, project on it, by degrees, one ounce of the above powder, stirring carefully, while you do it, with a stick. Leave it thus in fusion for a little while, and then you may use it for making all sorts of plates It is so beautiful, that, if you test it on the coppel with lead, it will stand it perfectly.

XXVII. *The preparations of emery.*

1. Calcine eastern, or Spanish emery, three or four times in the fire; then let it cool. Pound it and make *strata super strata* of it, with double the quantity of sulphur vivum in powder. Leave this crucible in the furnace with a strong fire during three or four hours. Repeat this process four different times over, then reduce your emery into an impalpable powder. Put it next into a matrass,

pour over it regal water, that it swim over by three fingers deep. Put this in digestion for eight hours. Pour off by inclination your regal water, impregnated with the dye Put new water on your matter, and set it on digesting again for eight other hours, as the former. Then take your thus tinged waters, which you will mix and put in a retort. Distil most part of it, till you see what remains in the retort is yellow. This is the true oil of emery, in which you put the bigness of a filbert of camphire.

2. Exsulphurate in a crucible, on a good fire, and during two hours, what quantity you please of arsenic. Then take two ounces of the aforesaid oil of emery, one of your exsulphurated arsenic, an equal quantity of salt of tartar drawn with distilled vinegar, two of sublimate, and two of silver; which you will have dissolved in an *aquafortis* made with nitre and vitriol. Put all together in a matrass, so large that the composition should occupy no more than a third part of it, of which you shall have cut the neck off, to obtain a more easy evaporation of the compounds from it. Put this matrass in the sand as high as the matter, and give it a moderate fire for two hours, then a strong one for six; let the fire go out of itself. Then you will find your matter in a stone in the matrass. Take it out, and pound it into powder, projected upon another ounce of salt in fusion; if you keep it a little while in that state, and throw it afterwards into oil of olives, will increase your gold by a third of its primary quality, and rather more: And you may thus increase it again and again, by repeating the same operation.

XXVIII. *To dye in gold silver medals, or laminas, through and through.*

1. This curious operation is performed by means of the admirable salt of Glauber, which is made with nitre and vitriol oil, in the following manner:—Take what quantity you please of nitre salt, pour over it a sufficient quantity of oil of vitriol, to swim over. When the ebullitions arising from that mixture shall be ended, distil to dryness; there remains a white salt, known under the name of salt of Glauber.

2 Dissolve in what quantity of warm water you think proper, or be in need of, a sufficient quantity of that salt as may saturate it, which you know, when you see the water can dissolve no more of it. In this dissolution put a drachm of calx, or, magister of gold. Then put in digestion in it silver laminas cut small and thin, for twenty-four hours, over a very gentle fire. At the end of that term you will find them thoroughly dyed gold colour, inside and outside.

XXIX. *To solder iron, or any other metal without fire.*

1. Take one ounce of ammoniac, and one of common salts; an equal quantity of calcined tartar, and as much of bell-metal, with three ounces of antimony. Pound all together and sift it. Put this into a piece of linen, and inclose it well all round with fuller's earth, about one inch thick. Let it dry, then put it between two crucibles, over a slow fire, to get heat by degrees. Push on the fire till the lump contained in the crucibles becomes quite red hot, and melt all together. Then let the vessels, and the whole, cool gradually, and pound it into powder.

2. When you want to solder any thing, put the two pieces you want to join on a table, approaching their extremities as near as you can one to another. Make a crust of fuller's earth so, that holding to each piece, and passing under the joint, it should be open over it on the top. Then throw some of your powder between and over the joint. Have again some borax, which put into hot wine till this is consumed, and with a feather rub your powder at the place of the joint; you will see it immediately boiling. As soon as the boiling stops, the consolidation is made. If there be any roughness, you must smoothen it, by rubbing with a grinding stone, for the file will have no power over it.

XXX. *To solder with fire.*

Make a paste of pulverised chalk and gum water, which put around the two broken pieces placed on a table, prepared as before-mentioned in the preceding receipt. The only difference is, that you are to rub over the two united extremities with melted soap; and, after having thrown some of the above powder at the place of the joint, hold a kindled piece of charcoal over it. This will immediately set the matter in fusion, which is no sooner done, but you may take off the paste, and you will find it consolidated.

XXXI. *To make borax.*

Take two ounces of roch-alum, dilute it, and mix it with two ounces of alkaline salt, which is used in making of glass. Put all into a pewter pot, and set it a-doing, for the space of half an hour, over a gentle fire; then take it out of the water. Take next two ounces of gem salt in powder, as much of alkaline salt, two pounds of virgin honey, and one of cow milk. Mix well all together, and set it in the sun for three days. Then the borax is done.

XXXII. *To render iron as white and beautiful as silver.*

Take ammoniac salt in powder, and mix it with an equal quantity of quick lime. Put them all together into cold water, and mix well. When done, any iron piece, which you shall have made red hot, will, if you steep it in that prepared water, become as white as silver.

XXXIII. *To calcine pewter, and render it as white and as hard as silver.*

Melt well your pewter in a crucible, so that it may be very fine and clear. Pour it afterwards into a very strong vinegar, then into mercurial water. Repeat that operation as many times as you please, you will each time give it an additional degree of hardness and whiteness, drawing near to silver; so much, that it will at last be very difficult to distinguish it from silver itself.

XXXIV. *To whiten brass.*

Brass, copper, iron or steel, may also be easily whitened by means of the butter from Cornwall tin, or pewter, prepared with sublimate, proceeding as follows.

Take Cornwall pewter, about one pound; add to it half that quantity of sublimate. Set it on a strong fire, and sublime. Throw away the first water. The second is good, which you know by its white colour. Now, if you make a piece of copper, brass, steel, or iron, it does not signify which, red hot, and steep it in that water, it will become as white as silver.

XXXV. *To extract gold from silver.*

1. Melt whatever quantity you please of lead, in a crucible, over a fire of clear and bright live-coals. Have at the same time in fusion an equal quantity of sulphur. Then take your first crucible, in which the lead is melted, off from the fire; and, before the lead shall congeal, throw in the same quantity in weight of quicksilver. Stir and mix well this with a stick. When this is done, pour your sulphur, from the other crucible, over the mixture of lead and quicksilver you have just made, and which coagulates, continually stirring carefully the matter with a spatula, for fear the sulphur should blaze and be consumed, before it is all poured in. When the whole is come quite cold, grind it on a marble table with a mullar. Then put all again into a crucible over the fire, and leave it in fusion till all the sulphur is burnt out, and the matter be fluid

enough to be cast in an ingot. This will look like the regulus of melted antimony. It will have even its brittleness.

2. Reduce this composition into powder, and with an equal quantity in weight of it and of silver laminas, make *strata super strata* of them, alternately, in a crucible, beginning and ending always with the powder. Then over the last bed, put about half an inch thick of Venetian glass, or crystal, reduced into an impalpable powder. Observe however that the crucible should not be filled so near the brim as to let the glass boil over. Make a fire strong enough to melt both the matters and the glass, and set them thus in fusion all together for an hour at least. Then take off, and let cool, your regulus; in breaking your crucible, make a coppel or test, in which you will put lead in fusion, till it is as fluid as it can be. Throw in your regulus to purify it by that test, in the same manner as silver-smiths do. When your silver shall be fallen to the bottom very pure, put in laminas, or granulate it; then put it to dissolve in aquafortis. You will see some small particles of fine gold precipitating from it, in the form of black powder. Wash these in warm water, then put them in fusion, in a crucible, and you will have true pieces of good gold, fit for any of the chymical physics, and capable to stand any test.

CHAP. III.

SECRETS FOR THE COMPOSITION OF VARNISHES, &c.

I. *A gold varnish.*

TAKE *karabe*, or amber, eight ounces, and two of gum-lac. Melt first the karabe, in a varnished earthen pot, or in the retort of an alembic, over a very strong fire. When this is melted, throw in the gum-lac, and let this melt in the same manner. Then take some of the fire off, and let it cool; observing with a stick, whether the matter has got all its fluidity. Mix in it six or eight ounces of turpentine oil. Keep stirring, in order to incorporate well this oil with the rest. Add also a spoonful of lintseed oil, prepared with *hepatica*-aloes, which, in order to reduce to the thickness of a syrup, mix with a sufficient quantity of oil of turpentine tinged with *rocou*.

II. *How to prepare the lintseed oil with the hepatica-aloes, for the above purpose.*

Prepare the lintseed oil with hepatica-aloes, by mixing four ounces of this in powder, with one pound of the said oil, over the fire, till it has acquired the consistence of a very thick syrup, and you see your oil beginning to scum, and to swell much. Then pass it through a piece of linen, let it cool, and bottle it, to keep for the abovementioned use.

III. *To draw the tincture of rocou, used in the composition of the above varnish.*

In order to draw the tincture of rocou, put four ounces of it in oil of turpentine. Set this over a gentle fire, in the retort of an alembic, and, as soon as the oil begins to boil, take it from the fire, stir it well with a stick, and filter it through a paper, to use it as directed before.

IV. *A varnish for icing.*

Concoct some turpentine with water and white wine, or brandy. When concocted, dissolve it in wine and oil of turpentine.

V. *An excellent varnish.*

Take what quantity you please of verdigrease, grind it with vinegar, put it in a piece of dough, as you would an apple to make a dumpling. Bake it in an oven as bread; then cut open your dumpling, and get the verdigrease out of it. Mix it with wine, and use it. Lay over it a coat of four ounces of gum arabic, then polish as usual. You will find it will answer your expectation, and be a very fine varnish.

VI. *For colouring and preserving gates, poles, barns, &c.*

Melt twelve ounces of rosin into an iron pot or kettle: add three gallons of train oil, and three or four rolls of brimstone. When the rosin and brimstone are melted, and become thin, add as much Spanish brown, or red or yellow oker (or any other colour you want, ground fine, as usual with oil,) as will give the whole as deep a shade as you like. Then lay it on a brush as hot and as thin as you can. Some days after the first coat is dried, give it a second. It is well attested that this will preseve plank for ages.

VII. *A red varnish.*

1. Take three ounces of gum lac, half an ounce of sandarak, as much of mastich in drop, and a pint of French spirit of wine. Put all in a matrass, which you must take care to lute well with potter's clay, and stop with paper. Have a large iron kettle, two parts of which shall be filled with sand Place the kettle over the coals, and lay the matrass on the sand.—Get the composition to boil in that situation for three hours. Strain it through a sheer-cloth bottle and stop it well, and keep it for use.

2. To make this varnish red, you put one ounce of vermilion to six of the said varnish. But to dilute the vermilion, you must begin by pouring, first some oil of aspic over it and then the six ounces of varnish, which will take near a quarter of an hour to mix well together.

3 Observe that the wood on which you want to lay it, has been first well polished. Rub it again besides with a pounce stone and vinegar, that all the pores may be well filled, and should appear no more. Then lay with a brush, first a coat of simple varnish, without vermilion. Let this dry; put on next your second coat, of that which is prepared with the vermilion; then a third and a fourth, according as you want it of a more or less deep red.

VIII. *A black varnish.*

1. Take gum-lac, four ounces; sandarak and black rosin, equal quantities one ounce of each. Pulverise all separately, and keep them distinct, to proceed afterwards in their mixture according to the following directions. Dissolve the rosin over the fire in a sufficient quantity of spirit of wine, then add the sandarak to it. As soon as this is also dissolved, add the powder of gum-lac, and stir well till all is melted together.—Strain it while warm, through a cloth. If any thing remain in the linen afterwards, add some more spirit of wine, to dissolve it as before, and strain it again.

2. The black colour is given to it by means of *two drachms* only of ivory black to every *two ounces*.

IX. *To make ivory black for the above purpose.*

Burn any quantity of ivory you please, in the fire till it is black. Put it into powder on a stone of porphyry. Add some water to it, and make a paste, which you let dry. Then grind it again, as before, with spirit of wine.

X. *A varnish for floors.*

Put a little petroly or rock oil with varnish and turpentine, and stir well. Lay it on your floors with an old hair broom, after having mixed in it the colour you want them to be.

XI. *A varnish from Flanders.*

Take æthereal oil of turpentine, and Venice turpentine equal parts. Mix them over a moderate fire, and use this boiling.

XII. *A varnish to lay on canvas sashes.*

Take fine and clear turpentine, four ounces; oil of nuts, two. Melt all together over a fire, and when it begins to boil, scum it, and use it hot with a brush.

XIII. *A varnish of shell lac for pictures.*

1. Take spirit of wine, one pound; pickled shell-lac, five ounces; sandarak, two and a half; white karabe and mastich, equal parts, two drachms of each.

2 First boil and skim the shell-lac and sandarak together, to have them the whiter. Then add the mastich and karabe to that, and put all in a matrass over a sand fire, to digest and concoct together by a gentle heat.

XIV. *Another varnish for pictures.*

Take four ounces of gum arabic, the clearest and whitest you can find. Put it to infuse in a pound of water, over ember ashes, for one night. Strain it in the morning through a cloth, having added the bulk of a nut of Narbonne-honey, and half that quantity of sugar candy. It is not to be used with a brush.

XV. *Another sort.*

Take *aquavitæ*, sugar-candy, and white of eggs, a reasonable quantity of each. Beat all well together to a froth. Underneath is a liquor, that is your varnish. You may lay it with a soft brush on any sort of picture.

XVI. *The Chinese varnish.*

1. Take pulverised and sifted sealing wax two ounces,

Put it in a matrass, with four ounces of turpentine oil. Give a gentle fire that all may melt If the wax be red, you need add nothing but the oil. If black, some lamp-black is requisite to be added still. And with this first composition, you lay on the first coat.

2. Next to this have aloes and karabe, of each two ounces. Dissolve this in a varnished pipkin, along with twelve ounces of lintseed oil, till all is well incorporated. There will fall a ground to the bottom, over which will swim a very fine and transparent liquor. Of this you are to make your second coat of varnish, laying it over the other after it is dry.

XVII. *To imitate jasper, or variegated black marble.*

Take *sulfhur vivum*, quick lime, *aquafortis*, and the green rind of walnuts, one ounce of each. Dilute all together, then lay it with a brush on what you want to be jaspered, whether a column, a table, or any thing else. This done, put your table or column, &c thus blackened, in a dunghill for the space of twelve days, and then take it out again, you will find it well veined and variegated. To give it a fine gloss, rub it with a varnish composed as prescribed hereafter. *see* Art. xix.

XVIII. *Another way.*

Make a large ball, with the drugs prescribed in the above receipt, to compose your black. Lay it for a week in a dunghill. When by that means it is well variegated, rub your intended piece of furniture with it.

XIX. *An excellent varnish to give a fine gloss to jasper or variegated black marble.*

Take oil of spikenard, three ounces; sandarak, well picked and clean, two. Have a new earthen pot well glazed. Set it before the fire a warming, without any thing in it. When hot, throw in it one half of the sandarak, and one half of the oil. Stir it well, lest it should burn, or stick to the pot.—When it is nearly melted, throw in the remainder of the oil and sandarak. When all is well dissolved and mixed, add a piece of camphire, to take away the smell of this composition, and let it dissolve; then bottle and stop it for use. It requires to be used hot.

XX. *A varnish which dries in two hours time.*

Melt four ounces of yellow amber, in a new earthen

pan, over kindled coals. Take care, in that operation, that the fire should but just reach and touch the bottom of the pan, and none should rise along the sides. Never cease to stir, from the moment it is melted, with a deal stick, add directly one ounce of sealing wax. As soon as this is also melted, add half an ounce of lintseed oil, previously thickened with a little gold litharge, then take it off from the fire, and stir it as before.—When the matter begins to be a little cold, then is the time of adding what quantity of turpentine oil you find necessary.

XXI. *A varnish for copperplate prints.*

Prepare water with some isinglass. Lay, with a very soft brush, a coat of this on the print. Next to this, lay another of the following varnish—True French spirit of wine, half a pound; gum elemi, two drachms, and sandarak, three.

XXII. *An admirable varnish.*

Take white mastich and lintseed oil, what quantity you please; a little turpentine, pounded glass, burnt verdigrease and pounded amber. Boil and melt all together in a new earthen pot. When done you will find it to be an admirable varnish.

XXIII. *A varnish fit to lay on all sorts of colours.*

Take one ounce of white amber, half an ounce of spirit of turpentine, four ounces of rectified spirit of wine, (the true French sort) one drachm of mastich, and as much of juniper gum. Put all together to infuse for eight days. Evaporate two parts of it over a gentle fire. What remains is a varnish fit for laying on all sorts of colours, and which will hurt, spoil, or damage none.

XXIV. *A varnish known under the appellation of* Beaume-blanc, *or white balm.*

Take spirit of wine, four ounces; gum lac, half an ounce; sandarak, two drachms; mastich, one. Pulverise the ingredients, and put them, with the spirit of wine, in a square bottle, large enough to be but half full, after the whole is in it.—Dissolve this over a slow fire, and take care the bottle be well stopped.

XXV. *A varnish to be used on plaister, and any sort of materials.*

To the varnish of copal and spirit of wine, only add some calcined chalk.

XXVI. *An excellent varnish, in which may be put, and diluted, whatever colour you like.—It suits equally well goldsmiths and limners.*

Take aspic and turpentine oils, of each one ounce; clean picked sandarak pulverised, four drachms; gum copal, two. The whole being well pulverised, put it along with your oils in a matrass, with the addition of half a pound of spirit of wine; and set it in a *balneo mariæ*. When the matter is dissolved, strain and keep it for use, in a glass bottle well stopped.

XXVII. *A Chinese varnish suitable to all the sorts of colours.*

1. Take one ounce of white amber, one quarter of an ounce of sandarak, as much of gum copal. Pound these together, and put them in a matrass, perfectly dry. To every ounce pounded and mixed thus together, put three ounces of spirit of wine. Stop well the matrass with a rag, some paste made with flour, and then another rag well tied over. Boil the varnish thus, over ember ashes, till the whole is dissolved: apply it as follows:

2. The piece intended for varnishing being previously well polished, you lay on it the proposed colour or colours, diluted in *aqua vitæ*, with some isinglass. When these are dry, pass on them two or three coats, according to discretion; allowing proper time between each coat of varnish to dry; and, when dry, polish it with olive oil and tripoly, then rub the oil with a rag.

Note. If you intend this varnish for miniature pictures, you are to make an addition of equal parts of gum copal and white amber.

XXVIII. *Chinese varnish, particularly calculated for miniature painting.*

Take one ounce of white *karabe*, or amber; and one drachm of camphire, reduced into a subtile powder, and put in a matrass, with five ounces of spirit of wine. Set it in the sun to infuse, during the hottest days, stir it two or

three times a-day. After a fortnight's infusing thus, put the matrass, for one hour, over hot ashes; then pass all through a cloth, and keep it in a bottle well corked.

XXIX. *How to make a red with varnish, of a much higher hue than coral itself.*

Take Spanish vermilion, grind it on a marble with brandy, and add to it the sixth or eighth part of lac. When done, mix this composition with as much varnish as you may find it requisite to apply.

XXX. *To make it gridelin colour.*

Dilute with your varnish some blue verditure, lake, and whitening.

XXXI. *To make it green.*

Substitute for the above ingredients, German green verditure, pewter in grain, and white lead.

XXXII. *Another way for the same.*

Grind, with water, on a marble stone, the finest orpine you can find, and a little indigo. Let it dry, then pound and mix it with varnish.

XXXIII. *To make it yellow.*

Take some Naples yellow, and mix it well with your varnish; then use it.

XXXIV. *To make it blue.*

Take ultramarine, lake, and whitening, and proceed as ordered in the other receipts above mentioned.

XXXV. *Another sort of varnish.*

Take shell-lac in grains, two ounces; two of sandarak; black rosin, two drachms; and spirit of wine, one quarter. Dissolve and prepare the whole as above.

XXXVI. *A transparent varnish fit for all sorts of colours.*

Take oil of nuts, and a little of the finest Venice turpen-

tine. Boil them together. Add a little brandy to it, and boil it also. Should the varnish prove too thick, thin it with an additional quantity of oil Make use of a very soft brush, and lay it carefully over the colours.

XXXVII. *To make sashes with cloth which will be very transparent.*

Take fine white cloth ; the finer, the more transparent the sashes will be. Fix the cloth very tight on a frame. Then make some starch with flour of rice, and lay a coat of it, as smooth as you can, on both sides your cloth, with a stiff brush ; let it dry. Then the following varnish, with a soft brush, having care to lay it on as equally possible.

XXXVIII. *The varnish fit for the above sashes.*

1. Take of the finest and whitest wax you can find, six pounds ; of the finest and clearest Venice turpentine, two ; one and a half of the most perfect lintseed oil. Have a new and varnished pipkin, larger, at least by one third, than is requisite to contain all these ingredients. Put first, in this pot, the lintseed and turpentine oils together, and set it over a small charcoal fire.

When this begins to be a little warm, put in the wax, cut in small bits, and take care to mix all well with a clean stick, till the wax is thoroughly incorporated with the rest.

2 Now take the pot off from the fire, and, while this composition is still a little warm, give a coat of it on both sides, prepared as before directed, and let it dry in the shade.

Note. You may render your sashes still more transparent, if, on both sides of them, you lay a smooth coat of the following varnish, with a soft brush.

XXXIX. *A fine white varnish.*

Take one pound of fine Venice turpentine, and as much of spirit of turpentine. Put this in a glass matrass, larger, at least by a third, than is wanted to contain the matter. Stop this matrass with another smaller matrass. The neck of which is to enter into that of the former. Have care to lute well both necks together, with paste and paper ; and when the luting has acquired a perfect dryness, set the first matrass on a sand bath, then set the varnish a-boiling for near an hour, after which take it off from the fire, and let it cool. When cold, bottle and stop it for use.

Note. Turpentine well purified from all its greasy parts, is the best and fittest to make the varnish for sashes.

XL. *A varnish to prevent the rays of the sun from passing through the panes of window-glasses.*

Pound gum adragant into powder, and put it to dissolve, for twenty-four hours, in whites of eggs, well beaten. Lay a coat of this on the panes of your windows, with a soft brush, and let it dry.

XLI. *To raise a relief on varnish.*

1. Dissolve one ounce and a half of gum arabic in two pounds of water. Grind with it bol armeniac and whitening, on a porphyry stone, till all is well united and incorporated.—With this composition fill up the vacancies between the outlines of your design, and form, as it is proper, the various reliefs, with the suitable proportions, and according to the sorts of things you are to imitate or represent. Then smooth the parts, and let it dry.

2. Next have ready prepared, in shells, the different sorts of metals which you want to use, diluted with gum-water; and, with a pencil, cover what places you are to cover. When this is also dry, burnish it skilfully with an ivory tooth, and lay a coat of clear varnish over the whole. A moderate heat is required for a moment, to help that varnish to dry.

XLII *To render silk stuffs transparent, after the Chinese manner; and paint them with transparent colours likewise, in imitation of the India manufactured silks.*

Take two pounds of oil of turpentine, very clear; add to it two ounces of mastich in grain, and the bulk of a filbert of camphire. Let this dissolve by a gentle heat, then strain it through a cloth. Of this oil lay one coat, or two, on both sides of your stuff. Allow, however a sufficient time between each coat, for each to dry, and let the second lie two days on before you touch the stuff again. When that time is over, draw the outlines of your design, and flowers, &c. cover this with a preparation of lamp-black and gum-water. Then fill the intervals with the intended and proper colours, suitable to the purpose, and which ought to be all transparent colours, diluted with a clear varnish. When this is done, and dry, lay on both the right and the wrong sides of the stuff another coat of clear varnish.

LXIII. *To make a transparent blue hue, for the above purpose.*

Take nine drachms of ammoniac salt; six of verdigrease, distilled and exficcated. Put both these into powder. Dilute these powders with tortoise oil. Put this on a very thick glass, which stop well, and set over hot ashes for a week.—After that time your colour will be fit for use, and make your drawings with the clear varnish, as directed in the preceding article.

XLIV. *To make a transparent yellow hue, for the same use.*

Take a new laid egg of that very day, make a hole in the shell, to draw the white out of it. Replace, by the same hole, with the yolk, two drachms of quicksilver, and as much of ammoniac salt; then stop the hole with wax. Set that egg in hot dung, or over a lamp fire, for four or five and twenty days. When that time is over, break the egg, and you will find a very fine transparent yellow, fit for the use abovementioned.

XLV. *To make a transparent green.*

Take verdigrease, gold litharge, and quicksilver, equal parts. Grind the whole in a mortar, with the urine of a child. Put it next into a bottle, and set it over a gentle and slow fire, for the space of seven or eight days. This composition will give a very fine transparent green, for the above purpose.

Note. We have given in the Sixth Chapter, several receipts for the composition of sundry transparent colours. We shall therefore take the liberty thither to refer the reader, for more ample satisfaction, and the completion of the abovementioned operation.

XLVI. *To give the abovementioned painted silks all the smell and fragrancy of the India ones.*

It is well known, that the silk, and other things, we receive from India, are all tainted with a certain particular smell, and agreeable fragrancy, which being their peculiar, distinctive, and most obvious character, if not imitated also, would help not a little in ruining the deception intended by the above labour. To imitate therefore, even this, you must observe the following direction. Have a small closet, if it be for works at large; or only a fine basket with a top to it, playing upon hinges, stuffed and lined all over in the in-

side, if it be for one single piece of silk. Put in either of them, and according to their extent, a proportionable quantity of cloves, whole pepper, mace, nutmeg, all-spice, camphire, &c. &c. Put your works among those ingredients, and keep either the closet or the basket perfectly close shut, till you see they have received a full impression from the odour of those ingredients.

N B. With the various compositions of varnishes, and preparations of colours, we have just given, there is almost no sort of works, coming from the Indies, but can be performed and imitated.

XLVII. *The true receipt of the English varnish, such as is laid on sticks and artificial made canes.*

Smoothen and polish well your sticks; then rub them, or your artificial made canes, with a paste made of flour. Then having diluted in water a discretional quantity of Flemish glue and red orpine, give one coat of this, very smooth and equal, to your sticks. If after this is dry, you do not think it sufficient, give them another, and let them dry Then, give them a third coat of clear varnish, made with turpentine and spirit of wine. After this is done, put a-soaking in an equal quantity of water and chamber-lye, some turnsol, cut very small. With this colour you touch your sticks, or canes, here and there with a hair brush. Then holding them perpendicular, on their small ends, between both your hands, you roll them quick and brisk, (as when you mill chocolate) in contrary senses. This operation gives them a negligent and natural like marbling; over which you are to lay another coat of varnish, and set them to dry.

XLVIII. *A fine varnish for all sorts of colours.*

1. Take two pounds of double rectified spirit of wine; seed lac, four ounces; sandarak, as much; gum copal, one. Set all a dissolving on hot ashes, in a matrass, or a vessel with a long neck. When perfectly dissolved, strain it through a jelly bag, made of new cloth. Mix with that which shall have strained out of the bag, one spoonful of oil of turpentine; then bottle and stop it well, and set it in the sun. There will happen a separation, and a certain coarser part will shew itself at the bottom, while another more clear will appear swimming on the top. Divide carefully, by inclination, the clearest from the thickest part.

2. This last you may use with fine lampblack, well picked and free from all sorts of hard knobs, to make a black colour varnish. With it you rub whatever you want to be varnished,

and lay one, two, or three coats of it, more or less, according as you think proper, letting it dry between each coat. And, when this is done, you put of the first separated clear part of your varnish, as much as you find requisite to give your work a fine lustre.

N. B. It is proper there should be some fire so near to the work, as it may receive from it some gentle heat while all this is performing; and when the whole is well executed, you must let dry in the shade what is varnished, and guard it against the dust.

3. If, instead of black, you want a red colour, you must from the very beginning of the operation, join some tacamahaca gum with the spirit of wine of double rectification abovementioned; and, in lieu of lampblack, in the second part of the operation, you put some cinnabar in powder. Then, when you have done with laying the several coats of varnish, in which the cinnabar is, you put in the clear varnish, which is destined to make the last coats for lustring, some dragon's blood in tears.

4. You may put, in the same manner, whitening in your varnish, if you want it white; or verdigrease, if you want it green; and so on any other colour you want it to be, proceeding, in respect to each of them, as before directed for the others.

N. B. These varnishes when dry, do all require to be polished. For that purpose, take a cloth, dip in tripoly, and rub, with moderation, over the last coat of varnish, till you find it has acquired a sufficient degree of lustre and equality.

XLIX. *A varnish to lay on, after the isinglass.*

Take spirit of wine, four pounds; white amber, fourteen ounces; mastich, one; sandarak, seven. Put all in digestion for twenty-four hours. Then, set the matrass on the sand, and give the fire for three hours, till all is perfectly dissolved. Add after four ounces of turpentine oil.

L. *A varnish to gild with, without gold.*

Take half a pint of spirit of wine, in which dissolve one drachm of saffron, and half a drachm of dragon's blood, both previously well pulverised together. Add this to a certain quantity of shell-lac varnish, and set it on the fire, with two drachms of *soccotrine* aloes.

LI. *A varnish water-proof.*

1. Take lintseed oil, the purest you can find put it in a

well glazed pipkin, over red hot charcoals, in a chafingdish. With that oil add, while a warming, about the fourth part of its weight in rosin. Make all dissolve together, and boil gently, lest it should run over the pot. At first the oil will turn all into a scum; but, continuing to let it boil, that scum will insensibly waste itself, and disappear at last. Keep up the fire till taking a little of that oil with a stick, you see it draw to a thread like as varnish does. Then take it off from the fire. But if, trying it thus, it prove too thin, add some more rosin to it, and continue to boil it.

2. When it is come as it ought to be, varnish whatever you want with it, and set it in the sun to dry, or before the fire, for it cannot dry without the assistance of either of these.

N. B This composition of varnish has this particular property, viz. that if you lay it on wooden wares, hot water itself cannot hurt it, nor have the least power on it. You may therefore make a very extensive use of it. But you must take care to choose the finest and most perfect rosin, and to boil it well for a long time.

Quere. Would not such varnish be extremely useful to preserve what is much exposed to the injuries of the weather, in gardens and elsewhere, such as sashes, statues, frames, hot-houses, &c.

LII. Callot's *varnish, mentioned in Chap. I. p. 5.*

1. Take two ounces of the finest lintseed oil; benjamin, in drops, two drachms; virgin wax, the bulk of a filbert. Boil all this together, till it is reduced to one third; and, while it is a boiling, never cease to stir with a little stick. When done, bottle, or put it in a large mouthed vessel.

2. To use that varnish, warm a little the plate you intend to engrave upon; and taking a little of the varnish with the tip of your finger, spread it delicately over the plate. Observe to put as little of it as you can, and to lay it on as smooth and equal as possible. When done, smoke the plate on the varnished side, with a candle, passing and repassing it gently over the flame of it, till it is black every where. Set it again, now, on the chafingdish, wherein there are kindled charcoals; and when the plate has done fuming, then the varnish is sufficiently hardened. You may then chalk, draw and etch, whatever you will on it.

Such is the true receipt of the varnish, which the famous *Callot* made use of to engrave his most admired and truly admirable subjects.

LIII. *A varnish to lay on paper.*

Begin by laying on your paper one first coat of very clear and thin size. This being dry, melt three parts of oil of spike and one of rosin together; and, when come to the consistence of a varnish, you lay one second and light coat of this over the first made with size. This varnish is very fine, when very smoothly and equally laid on.

LIV. *Another varnish.*

Take mastich and sandarak, equal parts, of each two ounces. Pound them into a fine powder. Have three ounces of lintseed-oil, and as much of spirit of wine, in which being mixed, you put your powders. Set this in a well stopped matrass, in a balneo mariea, to boil and concoct together for one hour; and this varnish is done.

LV. *L'Abbe* Mulot's *varnish.*

Take of spike oil, one ounce, pulverised sandarak, half an ounce. Put all in a bottle, and set it in the sun till perfectly dissolved. This composition is particularly fit to varnish gold or silver, in shell, which has been laid on with a hair pencil.

LVI. *A varnish to lay over plaister works, or figures.*

Take fine white Alicante soap, rasp it fine, and put it in a glazed pipkin. Dissolve that soap, in the pipkin, with your finger and a little water, added gradually, and little at a time, till it comes thick and milky. Cover this, for fear dust should come to it, and let it rest so for seven or eight days. Take, next, a soft and short hairy brush; dip it in this soapy preparation, and wash the plaister figure all over with it, then set it a drying. When dry, rub it gently with a piece of cloth, placing yourself between it and the light, that you may perceive better the places which take the polish; when done thus every where, your statue will appear as white, shiny, and beautiful, as alabaster.

LVII. *A very fine red varnish.*

1. Take oil of spike, one pound, and litharge as much. Boil both together, for one quarter of an hour, in order to clarify the oil, or, what is called, ungreasing it. When thus clarified, take one pound of it, and six ounces of shell-lac, which melt together in a matrass, or a varnished

pipkin. Then, dilute it in some cinnabar, which had previously been grinded on a stone with, chamber-lye, and the varnish is done.

2. Of this composition, lay first three or four coats on your work, and allow time sufficient, between each coat, to dry, when the last is given, lay on another of pure and clear varnish, without cinnabar, made with one part spirit of wine, and four of oil of spike, and some shell lac.

LVIII. *A varnish to gild certain parts of stamped leathers, silvered in some places with pewter leaves, and otherwise adorned with running stalks of flowers, various colours, figures, and other sorts of embellishments.*

1. Take lintseed oil, three pounds; of that sort of varnish called *Arabian sandarak*, and rough pitch, equal quantities, one pound each; and saffron, half an ounce. Instead of saffron, you had better, if you have that opportunity, make use of the staminus of lilies, which are infinitely preferable. Put all into a varnished pipkin, and set it over the fire. Take great care not to have it burn; and, to avoid it, keep continully stirring the matter with a spatula. When you want to know whether it be or not sufficiently done, have a hen's feather, just dip it in, and off quickly. If the feather be grizzled, it is a proof the matter has sufficiently boiled. Therefore, take it off from the fire and throw in one pound of well chosen and picked hepatica aloes, in powder. Mix well this with the spatula, and set it again on the fire, to concoct well this addition with the rest. If you see that your matter boils and swells, you must take it off, and let it rest awhile; during which time, take some of the coals away. Set it now again upon this more moderate fire, stirring always well, that all may be perfectly incorporated. As soon as this is done, take it off, let it cool a little, and strain it through a strong coarse cloth, and keep it for the following use.

2. Apply the silver, or pewter leaves, on the leather, with the white of an egg, or gum-water. When these, are properly laid on, give one coat of the above varnish, quite warm, on such places as you want to appear gilt, and set it in the sun. When dry, it looks like gold.

N. B. The *Arabian sandarak*, we have prescribed above, is known by some, under the denomination of *Gum of Jupiter*.

LIX. *An excellent varnish.*

Put in a glass bottle, one pound of white mastick. Pour over it oil sufficient to cover it. Place the bottle over the coals, or very hot ashes. The mastick will melt. Take

the bottle off the fire and shake it well, to see that the whole be perfectly dissolved. This varnish is very good to lay over prints, statues, columns, wood, &c.

LX. *A curious and easy varnish to engrave with aqua-fortis.*

Lay on a copper plate, as smooth and equal a coat as you can of Lintseed oil. Set the plate on a chafingdish in which there is a gentle heat of half consumed charcoal, that the oil may congeal and dry itself gently on. When it has acquired the consistence of a varnish, you may draw with a steel point in order to etch your copper and put on the aquafortis afterwards.

LXI. *A most beautiful Chinese varnish.*

Take one ounce of the whitest amber, or instead of this, the same quantity of the whitest gum copal; four drachms of sandarak; two drachms of fine mastick in drops. Put all this reduced into a powder, in a fine glass matrass; then pour over it one of the finest turpentine oil. Stop the matrass first with a cork, then with a bladder wetted. Set this to infuse over a slow fire for twelve hours. After this uncork the matrass and let it cool; then pour gently in it, six ounces of good spirit of wine, and stop it again as well as before. In that situation set it on ember ashes, or rather in balnea marie. In the space of another twelve hours, you will find that the spirit of wine will have dissolved all the gums. Then while the varnish is still quite warm strain it through a cloth; bottle and cork it, to keep for use.

LXII. *A varnish to render transparent the impression of a print which has been glued on glass, and the paper scratched off.*

Take turpentine, and a very little oil of the same spirit. Dilute all well together, and lay one coat on the strokes of engraving which are left fixed on the glass.

LXIII. *The varnish fit for Bronzing.*

Pound into subtile powder, one ounce of the finest shell-lac. Put it into a glass matrass of three half pints size. Pour upon it half a pint of the best French spirit of wine. Stop it well, and place it in the cool for four days, that the lac may have time to dissolve at leisure. During that time shake

the matrass, as if you were washing it, four or five times a day, for fear the lac should make a glutinous lump, and stick to the bottom. Should your lac, at the end of these four days be yet undissolved, set it on a gentle sand bath, to help finishing it; and when dissolved to perfection the varnish is done.

Note. Pour the spirit of wine on the lac gently, and a little at a time, that it may penetrate the powder the better. Also stop pouring by intervals, and shake the matrass as it were for rinsing, in order to mix all well; thus do till you have poured all the spirit of wine upon the lac.

CHAP. IV.

SECRETS RELATIVE TO MASTICHS, CEMENTS, SEALING-WAX, &c. &c.

I. *A subtile mastich to mend all sorts of broken vessels.*

TAKE whites of eggs and beat them well to a froth. Add to this soft curd cheese and quick-lime, and begin beating a-new all together. This may be used in mending whatever you will, even glasses, and will stand both fire and water.

II. *A mastich for broken wares.*

Pound a stone jar into an impalpable powder, and add to it some whites of eggs and quick-lime.

III. *Another Mastich.*

Take quick-lime, cotton and oil, of each equal parts in weight.

IV. *A cement.*

Take rosin, one ounce; grinded tile, half an ounce; mastich, four ounces.

V. *A glue to lay upon gold.*

Boil an eel's skin, and a little quick-lime together; when boiled gently for the space of half an hour, strain it, and add some whites of eggs beaten; bottle, and keep it for use. The method to use it afterwards, is to warm it, and lay a coat of it on marble, delph, Worcester, Stafford, or any other earthen wares, &c. and when nearly dry, write, paint, or draw what you please on with a pencil, and gold in shell.

VI. *A size.*

Take half a pound of fresh cod's tripes, boil it in two quarts of white wine, reduced to one-third. To take off the bad smell, add, while it boils, a little cloves and cinnamon. Then throw this size in whatever mould you please, to make it in flakes.

VII. *An exceeding good size, called Orleans size.*

Take the whitest isinglass you can find; soak it in finely filtered quick-lime water, during twenty-four hours. When that time is over, take it off bit by bit, and boil it in common water.

VIII. *Another for the same purpose, which resists water.*

Take quick lime, turpentine, and soft curd cheese. Mix these well together; and, with a point of a knife, put of this on the edges of the broken pieces of your ware, then join them together.

IX. *A cold cement for cisterns and fountains.*

Take litharge and boil in powder, of each two pounds; yellow ochre and rosin, of each four ounces; mutton suet, five ounces; mastich and turpentine, of each two ounces; oil of nuts, a sufficient quantity to render malleable. Work these all together; and then it is fit for use.

X. *A lute to join broken vessels.*

Dissolve gum arabic in chamber-lye over a chafingdish; stir with a stick till perfectly dissolved, then add an equal weight of flour, as you had of gum arabic, and concoct the whole for one quarter of an hour, or more, if requisite.

XI. *A strong glue with soft cheese.*

1. Take a cheese from Auvergne. Let it be the fattest and newest you can find, neither dry nor moist; wash it in very warm water, so long as it should remain clear; then set it to rot in clean water, till it begins to stink. As soon as you find it is so, boil it in water with quick-lime; and when dissolved into a glue, take it off from the fire, it is done.

2 If you dry some whites of eggs in the sun, and then pounding them into powder, you shall add some of that powder with the cheese when you dissolve it along with the lime, the glue will be so much the stronger.

N B. Observe that no other cheese, besides that which comes from Auvergne, has the quality requisite for this composition.

XII. *To make a strong mastich.*

Take one pound of rosin, a quarter of a pound of shoemakers rosin, two ounces of new wax, two of black pitch, and one of tallow. Boil all gently together on a slow fire; and when well incorporated together, add some brick dust, finely sifted, according to discretion.

N.B. The quantity of tallow is to be proportioned to the degree of dryness you require in this composition; so that you may on that principle, discretionally increase or diminish the prescribed dose of that ingredient.

XIII. *Sealing wax.* Recipe 1st.

Take one pound of shell-lac, benjamin and black rosin, half an ounce each, vermilion, eight drachms; the whole being melted, make your sticks on a marble table, rubbed over with oil of sweet almonds, and take care to have done before the wax is cold.

XIV. *Another.* Recipe 2d.

Take turpentine and sailors's pitch, six drachms of each; either shall-lac, or dragon's blood, one; sulphur citrinum, two. Mix and incorporate all together over the fire, and form your sticks.

XV. *Another.* Recipe 3d.

Take gum *hæderacea*, shell-lac, sandarak of the ancients otherwise printer's rosin, and mastich, two ounces of

each; rosin, four ounces, turpentine, half an ounce. Mix all in a very warm bell-metal mortar, and make your sticks.

XVI. *Another.* Recipe 4th.

Take shell-lac and mastich, of each one ounce; dragons's blood, three; cinnabar, half an ounce; turpentine, one. Mix all, and make your sticks.

XVII. *Another.* Recipe 5th.

Take Greek pitch, one pound; white mastich, five; frankincense, five ounces; cinnabar, as much as you see requisite to give the red colour. Put the pitch first on the fire to melt; next put the mastich, and the powder of frankincense; and last of all, the cinnabar grinded with a little oil. Incorporate all well and take it from the fire, to make your sticks.

XVIII. *Another.* Recipe 6th.

Take shell-lac, twelve ounces; mastich and rosin, of each one ounce; dragon's blood, three; minium, half an ounce. Dissolve the shell lac in vinegar: add if you will some turpentine oil and sulphur, to the quantity of four ounces of each, and two of ammoniac salt. The whole being melted, make as fast as you can, your sticks of the form and size you like.

XIX. *Another.* Recipe 7th. *Excessively good.*

1. Take shell-lac, &c. pound them all into a very fine and impalpable powder. Then have two wooden pallets present upon them, before the fire some powder of one sort to melt, them move and stir it with the said pallets. Take again of another powder in the same manner, and mix it in the same way before the fire with the first. Then another and another, till they are all by this method, perfectly well amalgamated together.

2. Have now some cinnabar in powder, which put in a pan with water. In that water and cinnabar powders, set to infuse, or only touch your incorporated gums, to make this composition take colour. When thus sufficiently coloured, take it out of the water with both your hands and the wooden pallets, and have a person to help you. Thus having wetted his hand, will draw some of the said gum, and handling it on a table, will form the sticks. For two pounds of gums, two ounces of cinnabar are wanted.

XX. *Another.* Recipe 8th.

Take gum-lac, four ounces, cinnabar, half an ounce, rosin, four and a half. Melt the rosin with a little vinegar and skim it. Then take it out of the fire, then mix it with the lac and vermillion both well pulverised, and when the composition begins to cool, from your sticks with it.

XXI. *An excellent sealing wax,* by Girardot. Recipe 9th.

Put four ounces of rosin, and four and a half of whitening, and melt them together in a non-varnished pipkin, over kindled coals. While this is in fusion, have another pot, similar to this, in which you keep two ounces of shell-lac, in dissolution with vinegar. Now steep a wooden stick in the first pot, and another in the other pot; then, hver a chafingdish turn quickly, one over another, the ends of your two sticks together, to mix and incorporate well what matter they shall have brought along with them from each pipkin. And after having turned them thus a reasonable time, you see both matters are well embodified, steep them, at different times, in the following liquor to colour them.

XXII. *A colour for the above wax.*

Grind upon a porphyry table, two ounces of cinnabar, with a sufficient quantity of nut-oil, to make it a liquid. In this you dip your sticks at several times, and take care in doing it, the composition should not grow cold. Wherefore you must each time you steep them in the colour, carry them again over the chafingdish to keep them in a due state of mallability. And when you find the matter sufficiently tinged with red, form your sticks as usual, on a marble or well polished table.

XXIII. *To make sealing wafers.*

Take very fine flour, mix it with glair of eggs, isinglass, and a little yeast; mingle the materials; beat them well together, make the batter thin with gum water, and spread it even on tin plates, and dry it in stoves; then cut them for use. You may make them what colour you please, by colouring the paste, say with Brazil, or Vermillion for red; Indigo &c. for blue, &c.

CHAP. V.

SECRETS OF GLASS MANUFACTORY, AND THE MAKING COMPOSITIONS TO IMITATE PRECIOUS STONES, COMMONLY CALLED FRENCH PASTE.

I. *A cement to render crystal like diamonds, and give the sapphires of Alenson a hardness to cut glass with ease.*

Make a strong dough with sifted barley flour and petroly (or rock oil) Divide this paste in two equal parts. In one of them range your stones, so that they should not touch one another. With the other part of your paste cover this. Wrap up the whole with a good lute, and give it a wheel fire for four or five hours, gradually increasing the strength of the fire between every two hours. Then you will have a lump of stones, which will sparkle like true diamonds.

II. *A way of making diamonds.*

Grind on marble, equal quantities in weight of calcined silver, and French loadstone. Stratify in a crucible, your crystal stones, ready cut in imitation of diamonds, with this powder. Cover it with another crucible, and lute it well. Then set it in a glass-maker's furnace, for one month.

III. *To soften crystal, or any other coloured stone, so that you may cut it like cheese ; and restore it afterwards to its primary hardness.*

1. Take, in the month of August, goose's and goat's blood

Let each of them dry till very hard. When you want to soften your stones, take an equal quantity of each blood, pulverise it and put it in a pot. then pour over a strong lye made of pearl ashes. Leave it so for a while, stirring often ; then add about a pint of strong vinegar. In this preparation, if you set your stones, and warm it a little over the fire, they will become so soft, that you may take and cut, or form them afterwards as you will.

2. To restore them again to their former hardness, put them in cold water, and let them there lay for about one hour and a quarter, it will be quite sufficient.

3. But to give them their lustre again, you must take antimony in powder, spread it on a very smooth leaden table, then polish your stones on this. It will restore them to their brightness as before.

IV. *Another equally useful to soften crystal and steel.*

Make a strong lye of quick lime and pearl ashes. Run it nine or ten times more over new lime and new pearl ashes, each time. Then put to soak, in this preparation, any piece of crystal or steel, for the space of twenty-four hours, and you will see what a surprising degree of softness they will have acquired by it.

V. *A paste, which will produce as beautiful emeralds as natural ones.*

Calcine, six different times, rock crystal, and plunge it, as many times, in pure cold water. Grind it into powder, on a rock crystal stone, with a mullar of the same. When you have rendered the powder very fine and impalpable, to one pound of it, add another of salt of tartar, drawn from red tartar, mixed well. Join to this, sixty grains of red copper, and fifteen of silver, both in shell, but grinded separately. Now mix the last powders with the former, on a marble stone, and put all together in a clean and double nealed crucible. Lute it well with its lid, and when the lute is perfectly dry, put the crucible for six days on a clear but gentle fire; then increase the fire till the crucible becomes red hot, place it immediately in the ardent and glass melting furnace, and keep it there in the same degree of heat for a month, without interruption. Then let the crucible cool gradually in the furnace, which is done by letting the fire go out of itself, having previously stopped all the holes and openings of the furnace. When you break it, you will find a beautiful green, which is fit to cut by the lapidary.

Note. Be careful of this composition, for it has all the merit and advantage of the true *emerald*. It vies with it in weight, colour, and hardness. In short, the greatest connoisseurs cannot distinguish these emeralds from the finest real ones.

VI. *A composition, the fundamental basis of all enamels.*

1. Grind on marble, and sift through a very fine sieve, equal quantities of lead and pewter-calx. Put it in a varnished pipkin filled over with water. Boil it some while; then pour it by inclination, into another vessel. Put new water, to boil again over the calx, and decant it as before,

on the first water: which process you repeat till you have entirely dissolved all the calx. If some part of the metal remain at the bottom, too gross to be entirely carried by the waters, it must be put in a melting-glass furnace to calcine, having care to take out, in proportion as it turns into calx, the upper part of the matter. When it is all calcined, continue dissolving it, by means of boiling water, as you did at first. When you have got all your waters of dissolution, vaporise them over a slow fire; and particularly towards the end of the evaporation, have a singular care that the fire be not to fierce, which then remains at the bottom, very fine and subtilized.

2. To twenty-five pounds of this calx add an equal weight of frit, made of tarce, or white sand, well pounded and sifted through a very fine sieve, and four ounces of white salt of tartar, pounded and sifted in the same manner. Put these ingredients in a melting-glass furnace; melt and purge them there for ten hours. Then having taken the pot off from the fire, take out the matter, which, after having well pulverised, keep it in a close dry place, where dust cannot come at it.—Such is the first and principle matter to be used in the composition of enamels, of whatever sort of colour you want to make them.

VII. *To make an enamel as white as milk.*

1. To six pound weight of the matter just described, put forty-eight grains of magnesia, prepared as follows.

2. Put in an iron spoon, to the reverberating fire, the bits of magnesia, rough as it comes from the mine. When it is whitened, pour good vinegar over it, then break it small, and wash it several times with warm water. Dry, pulverise, and sift it, then preseve it in a covered pot for use.

3. This magnesia, and primary enamel matter, you put in the above prescribed proportion, in a crucible, on a glass melting fire, then throw the whole contents into clear water; dry it melt it again, as before, and throw it in the water again and so on. This operation repeat three times Being thus well purified, if you find it not quite white enough, add a little more magnesia, and begin the same process as before. Then take it off the fire, and make it into small round cakes. Such is the method of preparing the enamel to paint with on gold, and other metals.

VIII. *To make an enamel turquoise colour.*

Put six pounds of the said enamel primary matter in a varnished crown-glass pot. Melt and purge it three times as usual as prescribed in the preceding article. On the

third time project at four seperate times, three ounces of scories of copper, prepared as directed in Art. ix. mixed with ninety-six grains of zaffar prepared the same way exactly, and in the same manner as the magnesia, and forty-eight of that very magnesia, in subtile powder. Stir well the matter on the fire, at the time of each projection, with a long-handled iron hook; and when the colour seems to be to your liking, take it out of the fire, and make into small round cakes as usual. This will make a most beautiful turquoise enamel.

IX. *How to prepare the scories of copper for the above purpose.*

This preparation is very simple. Wash first, the scories well, and set them to calcine three days at the entrance of a reverberating furnace. Then grind this and sift it. Calcine again as before, grind and sift the same, repeating this operation three different times. When finished, it is called a calx of copper. Of this, mix three ounces with forty-eight grains of prepared magnesia, and ninety-six of zaffar also prepared, for a projection on enamel's primary matter, to make a fine sort of turquoise colour.

X. *To make blue enamel.*

Put in a varnished crown glass pot, in a melting glass furnace, four pounds of common primary enamel matter; two ounces of zaffar, and forty-eight grains of prepared scories of copper, all previously well pulverised and mixed. When this composition is in good fusion, throw it in water, then dry it, and put it again in the same pot. Leave it there till the matter is well incorporated, and proceed as directed for the others.

XI. *To make green enamel.*

1. Melt and purge, by the glass melting fire, and in a varnished crown glass pot, four pounds of the primary enamel matter. Leave it there twelve hours, after which throw it in water, dry it, and put it again in the same fire, for the same time, to cleanse it well

2. Grind into a very subtile powder, some of the aforesaid scories of copper, and some scories of iron. Mix these powders together, viz. two ounces of the former, and forty-eight grains only of the latter; which, being divided into three different parcels, project, at three distinct times, on the enamel matter in fusion, stirring well with an iron hook

at the time of each projection, that the colour may better incorporate; and in twelve hours afterwards you will find a very fine green enamel.

XII. *To make a black shining enamel.*

Take of our primary enamel matter in powder, four pounds; red tartar, four ounces; and of our prepared magnesia, in subtile powder, two. Put all this into a varnished pipkin, so large that all these powders together shall not come higher than the third part of the vessel, this matter, when melted, swell very much. When in perfect fusion, throw it into water; take it out to dry, then put it again in the pot, and purify it as before Do so till you find it sufficiently purified; then take the pot off the fire and the matter out of the pot.

XIII. *To make enamel, purple colour.*

Reduce into subtile powder, and mix well together, six pounds of our primary and general enamel matter; three ounces of prepared magnesia, and six of scories of copper, prepared as before mentioned. Melt and purify all this in a varnish pipkin, by placing it in a melting glass furnace. When in good fusion, throw this matter in water; dry it, and put it again in the same pot to purify it anew by the some process. If you find your colour to your liking, take the pot off from the fire, and keep your enamel for use.

XIV. *Another.*

Take six ounces of our general matter, two of prepared magnesia, and forty-eight grains of the aforesaid preparation of scories of copper. Pulverise, and proceed as above. This composition will give a very fine purple enamel, fit for all sorts of works which goldsmiths will employ it in.

XV. *A yellow enamel.*

Take, and reduce into a very fine powder, six pounds of the general matter; three ounces of tartar, and seventy-two grains of prepared magnesia. Put all into a pot large enough not to lose any thing of the matter when it comes to swell at the time of its fusion.

XVI. *To make a chrystaline matter, which serves as a basis to red-colour enamels.*

1. Take twenty-four pounds of salt, drawn from tritura-

tion, lotion, filteration, and evaporation; and sixteen pounds of white tartar, that is to say, of white and transparent river pebbles, calcined and reduced into an impalpable powder. Both these ingredients being equally reduced into a subtile powder, mix and wet them so as to make a hard paste of them, of which you will form small thin cakes. Put these cakes in pipkins, and place them in a lime or potter's kiln, where they are to calcine for ten hours.

2. When these cakes are well calcined, reduce them into a subtile powder, add four pounds of lead and pewter calx (prepared and subtilized as before directed, Art. vi.) and as much white tartar also calcined and purified by lotion, &c. These three last ingredients being reduced into a subtile powder, put them in a varnished pipkin, and place them in a melting glass furnace, there to be melted and purified, by throwing the composition, when in fusion, into water, then drying, &c. three times; after which the whole is completed.

XVII. *How to make a fine preparation of* fusible magnesia, *to be employed in the making of red enamels.*

1. Take whatever quantity of magnesia you please Add to it an equal quantity of nitre prepared by lotion, filteration, and evaporation. Set this matter in a pipkin to calcine for twenty-four hours by reverberating fire. Then take it out, and wash it with warm water, to cleanse it from all the nitre, and dry it When this magnesia be dry, it will be of a very fine red.

2. Now add to it its equal weight of armoniac salt. Grind all well on a marble stone, wetting it with distilled vinegar, so that it comes into a sort of clear paste, or colour for painting.

3. Then dry this matter; and, having pulverised it, put it a subliming in a strong glass matrass, with a long neck and a large belly. Give it the sublimating fire for twelve hours; break the matrass; weigh first the sublimed part, and mix it with what remained at the bottom; add as much new ammoniac salt as you had weight of sublimation. Grind these well together, wetting them with vinegar, then dry and sublime again as before. Renew this operation so many times as will be requisite, that the magnesia remain at last in a state of fusibility at the bottom of the matrass.

4. This liquid is fit for staining crystal of a very fine ruby hue; and, when employed with enamels, will render them of a most beautiful red.

XVIII. *To make a red enamel, of a beautiful ruby hue.*

Put twenty ounces of the above fusible magnesia, to one pound of the crystaline matter (Art. li) in good fusion.—Purify the whole well, and try the colour.

Note. According to the proportion of fusible magnesia you put in this composition, you raise or lower the hue of your enamel. And, if carried to the degree of rubies, it will prove bright and beautiful.

XIX. *To make an enamel, true* Balais-*ruby colour.*

Take ten pounds of our crystaline matter. Purge it in the melting glass furnace, by fusing it, then throwing it in water, drying, pulverising and melting again, &c three times. Put it again for the fourth time in fusion; and, when in that state, give it the purple colour by means of a proper quantity of fusible magnesia, as mentioned in the preceding article. After this project on it, at eight different distances of time, as much, calcined alum, in subtile powder, as you will find requisite to give it that degree of red hue you desire; which to imitate the *Balais* ruby colour, must be fuller and deeper than that of the clear rubies.

XX. *To make a bright enamel,* escarboucle *colour.*

1. Take very fine gold, one part. Purify it again, and open it in the following manner. Dissolve it in good regal water; distil it first from the gold, and recohobate it six different times. After this, take your gold powder from the vessel, put it in a crucible, covered and luted as usual, and place it in a furnace to the reverberating fire, where it shall be left to calcine till it becomes a very high and deep red, which cannot happen till after several days calcination.

2. Then, by projecting this part of well opened gold on twenty of the beforementioned crystaline matter, previously purged according to direction, and put in a state of good fusion, an enamel will be obtained, of the most beautiful, transparent, *escarboucle* colour.

XXI. *To make transparent frames.*

Boil for a quarter of an hour only, nut oil, six ounces; white wax, four; rosin, as much; and Venice turpentine, two. When lukewarm, lay it on with a soft brush.

XXII. *To make a frame look as if made of glass.*

Take one of the finest and most perfect sheets of vellum you can find. Wash it, paste it on the frame, and let it dry. Then boil in a glass vessel, over a sand bath, equal quantities of nut or lintseed oil. in water, with a little crown glass, pounded into a very fine powder. With this you may at any time give a coat to your vellum, and see the pleasing effect it will have.

XXIII. *A white paint to preserve the putty round the panes of glass.*

1. Grind white lead with water. Dry it, and grind it again with oil, then lay a coat of it over your putty. But if you want it to be still more durable, put two coats of it, after having added a part of fœtid oil, made in the following manner.

2. Have a leaden plate with turned up edges to make a border. Fill it with nut or linseed oil. Cover it with a piece of glass, and expose it in the sun. It will soon be fœtid.

XXIV. *To clear glass.*

Rub the glass crystal with a piece of lead; that will make it clear and bright.

XXV. *How to distinguish a true form of a false stone.*

Warm an iron plate; rub some oil over it; spread glass dust on the middle, and cover that glass with kindled coals Hold the stone you want to try over these coals, without letting it touch them. If the stone does not lose its lustre, and look dull, it is a true stone.

CHAP. VI.

SECRETS CONCERNING COLOURS AND PAINTING.

§ I. TO PAINT IN VARNISH ON WOOD. USEFUL TO CARRIAGE PAINTERS.

I. *The preparations previous to the laying of colours, and the general process observing in laying them on it.*

1. YOU must first lay on the wood two coats of Troyes-white, diluted with size-water. Next lay over these a third coat of ceruse. Then mix the colour you want with turpentine oil, add the varnish to it, and lay it on the wood, previously prepared as follows.

2. Polish the wood, first with shave-grass or horse tail, then with pounce stone. Lay afterwards six or seven coats of colour mixed with varnish, allowing after each coat a sufficient time to try, before laying on the next; then polish over the last coat with pounce stone, grinded on marble into a subtile powder. When this is done, lay two or three coats of pure white varnish. As soon as this is dry, rub it over with a soft rag, dipped into fine olive oil, then rub it with tripoly reduced into subtile powder, and having wiped with a clean piece of linen, pass a piece of wash leather all over it.

II. *To make a black.*

1. The black is made with lamp of ivory black, grinded on marble stone, with vinegar and water, till it is reduced into the most impalpable powder. Keep it in a bladder.

2. There if a sort of black which, from its hue, may be termed a velvet black. This is made of sheep trotter bones, burnt and reduced by grinding, like the other black, into an impalpable powder. Keep it the same as the other.

III. *To make blue.*

Burnt turnsol mixed with quick lime and water, then sized with leather size, makes the blue.

IV. *To make the Gridelin.*

Grind cochineal with whitelead and a little Venetian lake. According as you put more or less of this last ingredient, you make it darker or clearer.

§ II. TO PAINT ON PAPER.

V. *For the red.*

To make a red, take flat, or Venetian lake and Brazil wood, and boil all together, with an addition of black lead.

VI. *To make a fine yellow.*

You must boil some kermes in water impregnated with orpine.

VII. *To make a green.*

A mixture of vedigrease, sap green, Hungarian green, and *tervette*. The whole grinded on marble with a pretty strong leather size.

VIII. *To transfer a print on vellum, and then paint it.*

Chuse your print, and fit a sheet of transparent, or varnished paper to it, for width and breadth. Lay it on the print, and fix it by the four corners and the middle part of the four edges, on that print, by means of a little white wax, the bulk of a pin's head. Then with a fine lead pencil, sketch out on the varnished paper, all the outlines and turns of the print, which you plainly see through.—When done, rub the back of this varnished paper all over with red chalk, and carrying it on the vellum, fix it on it, as you did on the print. Then with a wooden or ivory blunt point, pass over all the strokes which are delineated on the varnished paper, the red chalk of the back will set of in all those parts, and lie on the velum, whereon you will find the print perfectly sketched, and fit to receive what colour you like.

§ III. COMPOSITIONS FOR LIMNERS.

IX. *How to prepare colours for limning.*

Most colours are prepared, and grinded with gum-arabic. Ochre makes the yellow; *courant mourant*, the

white; verdigrease, the green; ceruse, the grey; lamp-black, the black; cinnaber, the red; and gold in shell, the gold.

X. *To make what is called lamp-black.*

Put a large wick of cotton in a lamp, filled with nut oil, and light it. Prop over the flame an earthen dish, and now and then visit this dish, and gather all the black which fixed itself to it.

XI. *Another way of making black.*

Burn some nut-shells in an iron pan, and throw them in another full of water. Then grind them on marble with either oil or varnish.

XII. *To make a blue.*

Whitening grinded with verdigrease will make a very fine blue.

XIII. *To make a turquin blue.*

German turnsol infused for one night in chamber-lye, then grinded with a discretionable quantity of quick-lime, in proportion as you want to have it paler or darker.

XIV. *A fine green for limning.*

Grind some verdigrease, with vinegar, and a very small quantity of tartar; then add a little quick-lime and sap-green, which grind with the rest, and put in shells for keeping. If it become too hard, dilute it with a drop of vinegar.

XV. *Another for the same purpose.*

Grind on marble stone, verdigrease, and a third of tartar, with white wine vinegar.

XVI. *To make* Sap-green, *or blackberry green.*

Express the blackberry juice, when full ripe. Add some alum to it, put all in a bladder, and hang it in a chimney to dry.

XVII. *To make lake.*

Take three parts of an ounce of Brasil wood; a pint of

clear water; one drachm and a half of rochalum; eighteen grains of salt of tartar; the bulk of two filberts of mineral crystal; three quarters of a pound of the whitest sound, or cuttle-fish bones, rasped. Put all together in a saucepan to boil, till reduced to one third. Strain it three times through a course cloth. To make a finer sort, strain it four times. Then set it in the sun under cover to dry. That which dries the soonest is the finest.

XVIII. *To make a liquid lake.*

Pound some cochineal and alum together; then boil them with a quantity of lemon-peels, cut very small. And when it is come to the right colour you want, pass it through a cloth.

XIX. *Another way.*

On a quantity of alum and cochineal pounded and boiled together, pour drop by drop oil of tartar till it comes to a fine colour.

XX. *For the vermilion.*

Vermilion becomes very fine in *aquavitæ*, or in child's urine. But it will be still finer, if you put in *aquavitæ* with a little saffron. It is used with whipped whites of eggs.

XXI. *For the making of carmine.*

1. Boil two quarts of spring water in a varnished pipkin, and when it boils throw in seven pugils of pulverised *chouam*. After this has thrown two or three bubbles, take it off the fire and decant it in another clean pipkin. Then put in this water five ounces of cochineal in powder, and boil it for a quarter of an hour. Add three pugils of autour, in fine powder, and make it throw four bubbles. Then add three pugils of Roman alum in powder, and take it out directly from the fire, which must be made of live coals.

2. Strain all through a linen cloth, and divide this liquor into several delph vessels, and so let it remain for three weeks.—At the end of that term, pour off the water by inclination. You will find under a kind of mouldiness, which you must carefully pick off, and then gather the carmine.

Note. Every five ounces of cochineal give one of carmine.—It is to be grinded on marble. A general opinion prevails, that this operation is best done in the crescent of the moon.—How far it is needful to observe this precept, is left to the wise to determine.

XXII. *Colours fit for expressing the various complexions.*

1. For women and children, mix a little white and a little turnsol.
2. For men, a mixture of white and vermilion is proper.
3. For old folks, you must use some white and ocher.
4. For horses, you must chuse bistre, ocher and white. The dark brown horses require a little addition of black. The gray want nothing but bistre and white.

§ IV. TO MAKE TRANSPARENT COLOURS.

XXIII. *For the green.*

Put in very strong vinegar, verdigrease, rue-juice, and gum-arabic. Set this in the sun for a fortnight, or, if you have no sun, boil it on the fire. Strain it, bottle and stop it. Shake it well before using.

XXIV. *For the red.*

Make a lye with salt of tartar. In it, put to infuse for one night, some India wood, with a little alum. Boil all, and reduce to one third. Run it through a linen cloth, and mix some gum-arabic with it. With more or less alum, you make it of a higher or paler hue.

XXV. *For the yellow.*

Bruise Avignon seed, called *French Berries*; and put it in a lye of salt and tartar to boil on the fire, to the reduction of two thirds. Run it, and boil it one bubble more. Then bottle and cork it It must be shaken before using. A small addition of saffron renders it more lively.

XXVI. *For the blue.*

Soak in chamber-lye, one night, a quantity of German *Palma Christi*. Take it out and grind it with a little quick-lime.—More or less quick-lime will raise or lower it in hue. And nothing more is required to dilute it than chamber-lye and gum-arabic.

XXVII. *Another blue, very like ultramarine.*

Grind some indigo on porphyry with turpentine oil. Put

it afterwards in a glazed pipkin, and lute it well. Let it thus lay for the space of six weeks. The longer you leave it, the more blue it will be.

XXVIII. *A pale red to paint on enamel.*

1. Take the filings of a piece of good iron. Put them in a matrass with aquafortis, and set it on a slow fire. Let it boil gently till the filings are all dissolved.

2. When this is done, pour a little warm water into the matrass, and let it remain a few hours on the fire, then pour all into another vessel. When the liquor shall be quite clear, decant it out gently, and leave the powder, which is at the bottom, to dry.

3. Put this dried powder in a new crucible well covered and luted, then neal it gently on a very regular fire, and a little while after, take it out and let it cool.

4. Now one drachm of that powder, and three of yellow Dutch beads ground with mastich-oil, will give full satisfaction.

XXIX. *Process of making purple, for painting an enamel*

1. Take one drachm of very fine gold, forged weak. Cut in small bits, and neal it. Put that gold into a matrass, with one ounce of ammoniac salt, and two of good aquafortis, and set it on a gentle fire to run all into liquor.

2. Have two ounces of clear water, near boiling, and throw it in the matrass. This done, pour the whole in a glass phial of more than a quart size, to which add one ounce and a half of oil of tartar drop by drop. It will occasion an ebullition, which being ceased, you must fill the bottle with water, and let it rest till the gold falls to the bottom.

3. When the water is quite clear, decant it out gently, for fear of disturbing the gold and losing it. Then fill the bottle with new water, repeating this operation till the water is as clear when you decant it out, as when you put it in and has no more smell.

4. Take your gold out of the bottle, and put it on a fine brown paper, folded in four or five doubles, and turned up by the edges, in form of a little case or mould. There let it dry, and when dry, keep it for use.

5. Grind, next, some fine white frost glass; mix it with water, put it in a bottle, and shake it, then let it settle. When this powder is fallen to the bottom, decant off the water, and let the powder dry in the vessel.

6. The proportion to make the purple colour. Take

three grains only of your aforesaid gold dust to thirty of the white frost-glass, thus prepared. Mix both in a calcedony mortar with clear water. After the powder has settled to the bottom of the mortar, decant out the water, and let the powder dry in the mortar.

7. This done, take the powder out of the mortar, and putting it on a white bit of paper, dry it by a slow fire, till you see it has acquired a fine purple hue.

8. Grind, now, this powder with a little oil of spike, and put it in little cases made with cards, of which the edges are turned up. When the card has soaked the oil, the whole operation is accomplished. Preserve it, by putting it in small boxes, in a dry place.

XXX. *How to make a fine flesh colour.*

9. The mere addition of a little black to the above composition will make the finest colour for complexions, or flesh-colour, and may justly be deemed a ninth article in the process which is to be observed in its fabrication.

XXXI. *A good way to make carmine.*

Make a little bag, tied very close, of fine Venetian lake. Put it in a little varnished pipkin, with rain-water and cream of tartar, and boil it to a sirrup. Thus you will have a fine carmine colour.

XXXII. *For an amber colour.*

To much yellow, add equal quantities of each red and white.

XXXIII. *The whole process of making ultramarine.*

1. Make some of the brownest lapis red hot in a crucible then throw it into vinegar. Repeat this three times. When calcined, pound it in a mortar, and sift it. Then grind it on porphyry, with a mixture of lintseed oil and spirit of wine, in equal quantities, and previously digested together in a matrass, and often shaken to prepare them for this use. When you shall have subtilized your lapis powder, then incorporate it with the following cement.

2. Lintseed oil, two ounces; Venice turpentine, three; mastich, half a one; assa fætida, two; black rosin, as much; wax, half an ounce; yellow rosin, three. Boil all in a glazed pipkin, for a quarter of an hour; then run it

through a cloth into clear water. Take it out of that water; and, taking of this and of the grinded lapis, equal quantities, incorporate them in a glazed pan, and pour some clean warm water over, and let it rest for a quarter of an hour. Stir this water with a wooden spatula; and in another quarter of an hour you will see the water all azured. Decant gently, that water into another glazed pan. Pour new warm water on the grounds, and proceed as before, continuing to stir and beat it well; then decant again this new azured water with the former Repeat doing so, till the water is no more tainted with any azurine particles. When done, set your azured waters in evaporation, and there will remain at the bottom a very fine Azure of Ultramarine, viz. four ounces of it for every one pound of composition. Of the remainder you make what is called cender blue.

XXXIV. *Another very fine ultramarine.*

Take the finest lapis lazuli you can find; break it in little bits, and make it red hot in a crucible, between blasting coals. When red hot, throw it in white wine vinegar; then dry it and pound it in a marble mortar with a wooden pestle. Should it not pound easily, calcine it again as before, and throw it again in vinegar, &c. then try it in the mortar, and if it do not pound yet, repeat again the same process till it easily submits to be pulverised. After it has been put into a fine powder, grind it on a porphyry stone, with good aquavitæ, till it is impalpable. Then gather it up in little cakes, which set a drying on paper of slates. When dry, if you pulverise it, you have a fine ultramarine.

XXXV. *A secret to compose a fine blue, for washing, in drawings instead of ultramarine, which is too dear and too strong to be used for that purpose.*

1 Gather in the summer, a large quantity of blowart, whichgrows in the fields among the corn. Pick well their blue leaves off. Have lukewarm water impregnated with impalpable powder of alum. Put the picked blue leaves into a marble mortar, with a sufficient quantity of that alum water, to soak them only. Then, with either a wooden or marble pestle, pound them, till the whole is so mashed, as to give the juice by expression through a new cloth. Then strain it over a glass bowl, in which there is water impregnated with the whitest gum-arabic you can find.

2. Observe that you must not put much alum in the first water, if you are desirous of preserving the brightness

of the colour: for by putting too much of that ingredient, as well as for the water impregnated with it, you darken the tone of the colour.

3. *Note.* By means of the same process, you may likewise draw the colours from every flower which has any great eclat. You must not neglect to pound them with alum water, which prevents the colour from suffering any alteration; as it sometimes happens at the very first bruise.

4. To render these colours portable, set them a-drying in the shade, in glass vessels, well covered, to fence them against the dust.

XXXVI. *The true secrets of making* iris-*green.*

1. Take a large quantity of the flowers of that name in the spring. Pick them; that is to say, pick out the green and the yellow, which are at the bottom of the petal of the flower. Next to this, pound them in a marble mortar, with a little lukewarm water, impregnated with alum. When pounded, express the juice through a new cloth, over a china bowl. Then mix some gum-arabic water with it.

2. If you want a tone of colour different from the natural colour of the flower, you may change it by only adding, after the flowers are pounded, a little quick-lime dust in the mortar, and give two or three strokes of a pestle more to the whole; then strain it.

3. *Note.* If you should pound these flowers in a wooden mortar, you must be cautioned at least to take care it should not be one of walnut tree wood, because it is apt to tarnish the colours, and destroy their brightness, which is one of the chief things always required in colours.

4. In the month of March, you may by means of the same process, obtain the colour from garden, or double violets. But this is never so fine nor so lively.

XXXVII. *To make a dark green, for miniture pictures, washing on paper, on draperies and terraces.*

Take, towards the end of autumn, a good quantity of wall-wort stalks, with their fruits on them, and very ripe. Let them rot for five or six days in the cellar; and when you see the fruits have fomented sufficiently to give easily their juice by expression, strain it through a new cloth in alum water. Divide the whole into several glass tumblers, to dry it more easily. Set them in the air, but not in the sun; and lay some paper over them, to prevent any thing from falling into the glasses, but which should not at the same time stop the exhalation of the liquor, and

thereby cause it to become mouldy. By these means you shall have a colour fit for the wash of a green hue ; and dark at the same time.

XXXVIII. *To make the Bistre for the wash.*

1 Grind on marble, with child's water, some chimney-soot. Mullar it as fine as possible. When done, put it in a wide-mouthed bottle, which fill up with clear water ; and then, stir and mix all well with a wooden spatula. Let the coarsest part settle to the bottom of the vessel. Decant out the liquor gently into another vessel. What remains in the bottom in the coarsest bistre.

2. Proceed the same with respect to the second bottle, and after having left this to settle for thee or four days, instead of half an hour, decant it into a third. This gives you the finest bistre.

3. In the manipulation of all the colours which are intended to serve in drawing for wash, whenever you will not have them rise thick above the surface of the paper, which would undoubtedly look very bad ; for the neatness required in a draught, forbids the use of any coarse colour.

XXXIX. *The secret for a fine red for the wash.*

1. Make a subtile powder with cochineal. Put it in a vessel, and pour rose-water over it as will exceed above it by two fingers.

2. Dilute calcined and pulverised alum, while it is quite warm, into plantain water, and mix some of the liquor in which you have dissolved the cochineal.

3. This process will give you a very fine red, much preferable for the wash, to that which is made with ver milion, because this last has too much consistence, and besides tarnishes too soon, on account of the mercury which enters into its composition.

XL. *A secret to make carmine at a small expence.*

Break and bruise in a bell-metal mortar, half a pound of gold colour Fernamborough Brasil. Put this to infuse with distilled vinegar, in a glazed pipkin, in which boil it for the space of a quarter of an hour. Strain the liquor through a new strong cloth ; then set it again on the fire to boil. When it boils, pour on it white wine vinegar, impregnated with roman alum. Stir well with a wooden spatula, and the froth that will arise is the carmine. Skim it carefully in a glass vessel, and set it to dry.

§ V. COMPOSITION OF COLOURS, TO DYE SKINS OR GLOVES.

XLI. *A lively Isabel.*

To make a lively Isabel colour, you must, to a quantity of white, add one half of yellow, and two-thirds of red and yellow.

XLII. *For a pale filbert colour.*

1. Take burnt umber, a little yellow, very little white, and still less red.
2. This is made darker, by adding a quantity of burnt umber, as much yellow, a little white, and as much red.

XLIII. *For the gold colour.*

To much yellow, join a little more red; and this mixture will give you a very fine bright gold colour.

XLIV. *For the flesh colour.*

To imitate well the complexion, or flesh colour, you mix a little white and yellow together, then add a little more red than yellow.

XLV *The straw colour.*

Much yellow; very little white; as little red, and a great deal of gum.

XLVI. *A fine brown*

1. Burnt umber; much black chalk; a little black, and a little red; will make a fine brown, when well incorporated together.
2. The same is made paler, by decreasing the quantity of black chalk, and no black at all in the above composition.

XLVII. *To make a fine musk colour.*

Take burnt umber; very little black chalk; little red and a little white These ingredients well mixed will produce as fine a musk colour as ever was.

XLVIII. *To make a frangipane colour.*

1. This is made with a little umber ; twice as much red, and three times as much yellow.
2 The paler hue of it is obtained by adding only some white, and making the quantity of red equal to that of yellow.

XLIX. *An olive colour.*

To make the olive colour, take umber, not burnt ; a little yellow ; and the quarter part of it of red and yellow.

L. *How to make skins and gloves take these dyes.*

Grind the colours you have pitched upon with perfumed oil of jessamine or orange flowers. Then range the grinded colour on a corner of the marble stone. Grind of gum-adragant, an equal quantity as that of the colours, soaking it all the while with orange flower water. Then grind both the gum and the colour together, in order to incorporate them well. Put all into a pan, and pour a discretionable quantity of water over it, to dilute sufficiently your paste Then with a brush, rub your gloves or skins over with this tinged liquor, and hang them in the air to dry. When dry, rub them with a stick. Give them again, with the same brush another similar coat of the same dye, and hang them again to dry. When dry for this second time, you may dress them, the colour is sufficiently fixed, and there is no fear of its ever coming off.

LI. *To varnish a chimney.*

Blacken it first with black and size. When this coat is dry, lay another of white lead over it, dilute din mere sized water. This being dry also, have verdigrese diluted and grinded with oil of nuts and a coarse varnish, and pass another coat of this over the white.

§. VI. TO COLOUR, OR VARNISH COPPER PLATE PRINTS

LII. *To varnish copperplate prints.*

1. Have a frame made precisely to the size of your print. Fix it with common flour paste, by the white margin on that frame. Let it dry, then lay the following transparent varnish on it, which is to be made without fire.
2. Dilute in a new glazed pipkin, with a soft brush, as big

as your thumb, about a quarter of a pound of Venice turpentine and two penny worth of spike, and turpentine oils, and half a gill, or thereabouts, of spirit of wine. This varnish being no thicker than the white of an egg, lay with your brush, a coat of it on the wrong side of the print; and, immediately another on the right. Then set it to dry, not upright, but flat. And, if it should not dry quick enough, pass a light coat of spirit of whine on the whole.

LIII. *How to colour these prints, in imitation of pictures in oil colours*

1. To paint these prints, you must work them on the back in the following manner; Prepare first your colours on a pallet, and then proceed thus;

2. The flesh colour is made with a little white and vermillion, which mix with your pencil according to the degree of redness you will have it.—For the green of tree-leaves, you must have mountain-green, ready prepared from the colourman; and for the finest green, some verdigrease. As for the lighter shades of these colours, you only add some yellow to either of the above two, more or less, according to the circumstances. To paint woods and trunks of trees, nothing more is required than umber.—To express sky-colours and clouds, you mix some blue ceruse with white lead; and with these two colours only, you alter your blues to various degress of shades, diminishing or augmenting one of the two, according to the darkness or lightness of the skies which you want to express. For the distances, a mixture of yellow and white lead, and so on for the other colours you may want.

3. You are to compose them yourself on the pallet with the pencil; and to mix or to unite them, use a little oil of nuts, which take up with the point of the pallet-knife.—Then, with your pencil, you apply them on the wrong side of the print.

LIV. *A varnish which suits all sorts of prints and pictures; stands water; and makes the work appear as shining as glass*

Dilute one quarter of a pound of Venice turpentine, with a gill, or thereabouts, of spirit of wine. If too thick, add a little more of this last; if not enough, a little of the former, so that you bring it to have no more thickness than the apparent one of milk. Lay one coat of this on the right, side of the print, and when dry, it will shine like glass. If it be not to your liking, you need only lay another coat on it.

LV. *To make appear in gold the figures of a print.*

1. After having laid on both sides of the print, one coat of the varnish described in the above Art. lvi. in order to make it transparent, let it dry a little while. Then, before it is quite so, lay some gold in leaves on the wrong side of the print, pressing gently on it with the cotton you hold in your hand By these means all the parts, whereon you lay these gold leaves, will appear like true massive gold on the right side.

2. Now, when this is all thoroughly dry, lay on the right side of it, one coat of the varnish described in the preceding Art. lvi it will then be as good as any crown-glass.—You may also put a pasteboard behind the print, to support it the better in its frame.

LVI. *A curious secret to make a print imitate the painting on glass.*

Chuse a crown-glass of the size of your print ; and lay on it two coats of the following varnish ;

1. Put on the fire, in a glazed pipkin, and let boil for the space of one hour, Venice turpentine, four ounces ; spirit of the same, and of wine, equal parts, one ounce and a half of each mastice in tears, two drachms.

2. After it has boiled the prescribed time, let it cool, and then lay the first coat on the glass ; This being dry, lay another ; and, as soon as this is nearly dry, then lay on it, as neatly as possible, the print, previously prepared as follows.

3. Have a glazed vessel so broad at bottom as to admit of the print flat with all ease in its full size. Let this vessel be also as wide at top as it is at bottom, that you may get the print in and out of it on its flat, without bending it in the least. Pour aquafortis in this pan or vessel, enough to cover all the bottom, then lay the engraved side of your print on that aquafortis. Take it out, and wipe the aquafortis off gently with soft rags, then steep it two or three times in three different clean fresh waters, and wipe it each time in the same manner.

4. This being done, lay the right side on the before mentioned glass, before the second coat of varnish be quite dry, and while it is still moist enough for the print to stick upon it uniformly, equally and smoothly, without making any wrinkles or bladders. When it is perfectly dried in in that situation, wet your finger in common water, and moistening the print on the back part in all the white places, which have received no impression from the engraving of the plate, rub it all off. By these means there will remain nothing but fairly the printed parts. On them

you may paint in oil with a brush, and the most bright and lively colours ; and you will have pictures, on which neither dust nor any thing else, will be able to cause any damage. To do this, there is no need of knowing either how to paint or draw.

LVII. *The method of chalking, for those who are not acquainted with drawing.*

They who are not acquainted with the principles of drawing, may amuse themselves with chalking some beautiful prints on white paper, where they shall have nothing more to do afterwards than shade, in the same manner as they see done in the original. When they shall have practised for a while in that way, they will soon become able to strike out themselves some good piece or design. And to obtain that point, the following method is recommended

1. With a soft and one of the best black lead pencils, rub one side of a white sheet of paper cut to the size of the print, so that nothing of the paper can be seen, and only the black lead colour Lay this sheet on the clean side, upon the face of the print, that it may not soil it ; and on this sheet, the black side of which now lies uppermost towards you, lay another sheet of clean paper, and fix these three sheets together by the four corners, and on the edges with fine pins so that the sheets may not vary one from another, which would quite confuse and mar the whole design.

2. Now take a blunted needle, or ivory point, and slip it, in pressing gently all over the turns of the prints, going gradually and orderly, for fear of forgetting some places, which may be prevented by laying a flat ruler across the print under your hands. When the whole is finished, unpin the papers, and on the under part of that which lays at top, you will find all the outlines of the print most exactly drawn.

3 You may now on these outlines, pass a stroke with India ink and a brush, or with ink and a pen ; after which, with a crum of stale bread, you rub off clean all the useless marks of the pencil, and leave none but those marked with ink. And to shade this design, wash it with India ink, or colours, and a brush.

LVIII. *To prepare a transparent paper to chalk with.*

In order to obtain the art of chalking neatly, and not to go out of the fine turns and outlines of a drawing. beginners should first know how to prepare a transparent pa-

per, which as it lets them see the minutest parts of the strokes as through a glass, gives them of course an opportunity of acquiring by practice, a correctness in the expression of all the turns of drawing. This preparation is as follows.

1. Have one or several sheets of fine and very thin paper, and rub them over with oil, or spirit of turpentine, mixed in double the quantity of oil of nuts. To cause the paper to imbide that mixture, steep a sponge or feather in it, which pass on both sides of the paper, and then let it dry.

2. When you want to use it, lay it on a print. Then, with a brush, a pencil, or a pen, pass over all the strokes, lines, and turns, of the design laid under. You may even thus learn to shade with neatness, if you wash that same design, while fixed on the original print, with India ink.

By practising often you may learn to draw very neatly, and even with boldness. This method will certainly prove very useful and entertaining, for those who have not the patience to learn by the common method, which seems too tedious to some, and generally disgusts beginners.

§ VII. FOR PAINTING ON GLASS.

LIX. *How to draw on glass.*

Grind lamp-black with gum-water and some common salt. With a pen or hair pencil, draw your design on the glass, and afterwards shade and paint it with any of the following compositions.

LX. *A colour for grounds on glass.*

1 Take iron filings and Dutch yellow beads, equal parts. If you want to have a little red cast, add a little copper filings. With a steel mullar grind all these together on a thick and strong copper plate, or on porphyry. Then add a little gum-arabic, borax, common salt and clear water. Mix these a little fluid, and put the composition in a phial for use.

2. When you come to make use of it, you have nothing to do but with a hair pencil lay it quite flat on the design you had drawn the day before; and having left this to dry also for another day with the quil of a turkey, the nib of which shall not be split, you heighten the lights in the same manner as you do with crayons on blue paper.—Whenever you put more coats of the above composition one upon another, the shade, you must be sensible, will naturally be stronger. And when this is finished, you lay your colours for garments and complexions as follows.

LXI. *Preparation of lake, for glass.*

Grind the lake with a water impregnated with gum and salt, and then make use of it with the brush. The shading is operated by laying a double, treble, or more coats of the colour, where you want it darker. And so it is of all the following compositions of colours.

LXII. *Preparation of the blue purple, for glass.*

Make a compound of lake and indigo, grinded together with gum and salt water; and use it as directed in the preceding article.

LXIII. *Preparation of the green for glass.*

Indigo mixed with a proportionable quantity of gamboge, and grinded together as above, will answer the intended purpose.

LXIV. *Preparation of the yellow for the same.*

Gamboge grinded with salt water only.

LXV. *Preparation of the white.*

You have only to highten much the white parts with a pen.

LXVI. *The proper varnish to be laid on glass after painting.*

Boil oil of nuts, some litharge, lead filings, and white copperas calcined. When done and cold, lay it all over the colours which you put on the glass.

LXVII. *How to paint on glass without fire*

Take gum arabic and dissolve it in water with common salt, bottle and keep it. With this liquor, if you grind the colours you intend to paint with, they will fix and eat in the glass. Should you find they do not enough, increase only the dose of salt.

§ VIII. PREPARATIONS OF COLOURS OF ALL SORTS FOR OIL, WATER, AND CRAYONS.

LXVIII. *An oil to grind colours with, when the works are much exposed to the injuries of the weather.*

Take two ounces of mastich in drops, very clear, and grind it with linseed oil. Then put in a well glazed pipkin any quantity of that oil, and set it on the fire to boil. By little and little introduce in that boiling oil the above prepared mastich, stirring well the whole to mix and incorporate the better. When done, take it from the fire and let it cool. Such is the preparation of oil with which you are to grind your colours, when they are to be much exposed to the injuries of the weather, for they will resist it.

LXIX. *To marble and jasper paper.*

1. Grind all the colours you want to employ (such as lake, massicot, indigo, yellow and red ochre, &c. &c.) with bullock's gall; grind each separately, and keep them so. Then have a large and wide pan filled with lukewarm gum water. Stir well that water with a stick. While it is in motion and your colours being ready under your hand, with a large brush, take of each separately, as much as the tip of the brush will carry, and touch only the surface of the water with it. The colours will immediately expand. Each colour requires a particular brush to itself. Therefore, with another brush, take of another colour, and do the same; and, with another of another, and so on, till you have put on your water all those you have destined for the purpose.

2. When the water ceases to turn, you will plainly perceive all the variety occasioned by the different colours. Then, taking your sheet of paper, lay it flat on the water, leave it there for about two or three minutes, and, without taking it out, give it one turn round on the water, then pull it by one of the edges to the side of the pan, wash it, dry it, and burnish it afterwards.

Note. The paper must be chosen good, and the water fixed with gum adragrant.

LXX. *To clean pictures.*

Take the picture out of its frame. Lay a clean towel on it, which for the space of ten, fourteen, or eighteen days, according as you find it necessary, you keep continually wetting, till it has entirely drawn out all the filthiness from

the picture. Then, with the tip of your finger, pass some lintseed oil, which has been set a long while in the sun to purify it, and the picture will become as fine as new.

LXXI. *Another for the same purpose.*

Put into two quarts of the oldest lye one quarter of a pound of Genoa soap, rasped very fine, with about a pint of spirit of wine, and boil all together on the fire. Strain it through a cloth and let it cool. Then with a brush dipped in that composition, rub the picture all over, and let it dry. Do the same again once more, and let it dry too. When dry, dip a little cotton in oil of nut, and pass it over all the picture. Let this dry again; and, afterwards, warm a cloth, with which rub the picture well over, and it will be as fine as just out of the painter's hands.

LXXII. *A secret to render old pictures as fine as new.*

Boil in a new pipkin, for the space of a quarter of an hour one quarter of a pound of gray or Bril ash, and a little Genoa soap. Let it cool to a lukewarm, and wash your picture with it, then wipe it. Pass some olive oil on it, and then wipe it off again. This will make it just as fine as new.

LXXIII. *An oil to prevent pictures from blackening. It may serve also to make cloth to carry in the pocket against wet weather.*

Put some nut or lintseed oil in a phial, and set it in the sun to purify it. When it has deposited its dregs at the bottom, decant it gently into another clean phial, and set it again in the sun as before. Continue so doing, till it drops no more *fæces* at all. And with that oil, you make the above composition.

LXXIV. *A wash to clean pictures.*

Make a lye with clear water and wood ashes; in this dip a sponge, and rub the picture over, and it will cleanse it perfectly. The same may be done with chamber-lye only; or otherwise, with white wine, and it will have the same effect.

LXXV. *A very curious and simple way of preventing flies from sitting on pictures, or any other furniture and making their dung there.*

Let a large bunch of leeks soak for five or six days in a

pail full of water, and wash your picture, or any other piece of furniture, with it. The flies will never come near any thing so washed. This secret is very important and well experienced.

LXXVI. *To make indigo.*

Put some isatis, otherwise woad, or glastum, with slacked lime, to boil together in water. There will rise a scum, which being taken off, and mixed with a little starch, makes the indigo.

LXXVII. *To make a yellow.*

What the luteola dyes yellow, becomes green by the woad, or glastum. Whence we may justly conclude, that green is not a simple colour, but a mixture of blue and yellow as the yellow itself is a compound of red and white.

LXXVIII. *An azure of mother-of-pearl.*

Take any quantity of superfine tested silver in laminas. Put it a little while in vinegar; then take it out, strew over the laminas some pounce powder, to alcoholise them. Next stratify them in a crucible; and when red hot, take them off from the fire, and you will have a fine azure.

LXXIX. *A white for painters, which may be preserved for ever.*

Put into a large pan three quarts of lintseed oil, with an equal quantity of brandy, and four of the best double distilled vinegar; three dozen of eggs, new laid and whole; three or four pounds of mutton suit, chopped small. Cover all with a lead plate, and lute it well. Lay this pan in the cellar for three weeks, then take skilfully the white off, then dry it. The dose of the composition for use is six ounces of that white to every one of bismuth.

LXXX. *Another white for ladies paint.*

To four parts of hog's lard add one of a kid. Melt them together, then wash them. Re-melt and wash them again. Then add four ounces of ammoniac salt, and as much of sulphur, in subtile powder. This white will keep a long time.

LXXXI. *A good azure.*

Take two ounces of quicksilver; sulphur and ammoniac salt, of each one ounce. Grind all together, and put it to digest in a matrass over a slow heat. Increase the fire a little; and, when you see an azured fume arising take the matrass off from the fire. When cool, you will find in the matrass as beautiful an azure as the very ultramarine itself.

LXXXII. *An azure from silver, done in less than a fortnight.*

Dissolve in very strong vinegar, as much gem-salt and rochalum, as it will dissolve. Put this in a new pipkin; and over it hang up laminas of the finest tested silver. Cover the pot, and lute it well. Bury it in the celler; and ten or fifteen days afterwards take off the azure, which you will find about the laminas. Replace things as before; and, ten days afterwards, the same again; and repeat this process as many times as you can get any azure by it.

LXXXIII. *To make an azured water.*

1. Gather wallwort grains between green and ripe, and bake or stew them in a pan. When they have boiled a considerable time, strain them through a cloth, and keep the juice in a glass phial; its colour will never change, and will keep for ever very fine.

2. Have next dog's dung, very dry. Pulverise it very fine, and sift it through a silk sieve. Then grind it on a a marble with the wallwort juice, and a mullar, as painters do their colours, and you will find this paste of a very fine azure colour.

3. Now, if you tinge any water with this, by putting it in a phial to soak, you may dye whatever you will with it, such as thread, cotton, cloth, &c.

LXXXIV. *Another way of making azure.*

Take the bulk of a filbert of amoniac salt, which dissolve in a common half pint glass tumbler of water.—Then pound and sift, all together, one ounce of vitriol, and one and a half of quick-lime. Put this powder into the water in which the ammoniac salt was dissolved.—Leave this to infuse for the space of forty-eight hours, and at the end of that term the azure shall be done.

LXXXV. *A fine azure.*

Make an incorporation of three ounces of verdigrese, and of an equal quantity an ammoniac salt, which dilute with tartar water, so as to make a thick paste of it Put this composition into a glass, and let it rest for a few days, and you will have a fine azure.

LXXXVI. *Another way.*

Pulverise and mix well together one part of ammoniac salt, and two of verdigrease, with a little s: ruse Then pour over it oil of tartar, enough to make a clear paste of it. Put this in a glass vessel, which take care to stop and lute well. When done, put it in an oven along with the bread, and take it out with it also, then the azure will be done.

LXXXVII. *Another way.*

Take sublimed mercury, four parts; ammoniac salt, two; sulphur *vivum*, one. Pulverise the whole, and put the powder in a matrass, which lute well with the lute of sapience. Put this matrass on a mild and slow fire; and, when you see a white fume beginning to rise, stop the fire. When the matrass is cold, break it, and you will find a very fine azure at the bottom. Now take it, and work it with lukewarm water first, and then with cold.

Note. There are some who absurdly wash it with lye, or a strong lime-water; but they spoil their azure entirely What is most adviseable, and indeed the only preparation allowable, is to boil a little white honey in the water, and and skim it; and when that water becomes lukewarm, wash the azure with it. This may contribute to give it a fine colour, but the other will certainly hurt it.

LXXXVIII. *To make an admirable white lead, fit for oil bainting and colou ing of prints.*

Grind the finest white lead in flake you can find, on the stone with vinegar. It will immediately turn black. Wash it well in a pan ul of water, and let it settle. Pour the water off by inclination, and grind it again with fresh vinegar, then wash it a-new. Repeat this operation four or five times, and you will get a most beautiful white.

LXXXIX. *The preparation of verdigrease.*

Grind the verdigrease with vinegar, and put it in a piece of brown bread dough. Bake it as you would bread; and when done, cut it open and take it out. You will then have a very fine verdigrease, fit to work with, either in oil or water, as you like.

XC. *A fine liquid green.*

Mix well together one pound of Montpelier verdigrease, and half a pound of white tartar from the same place. Put this a soaking for twelve hours in two quarts of the strongest vinegar, then reduce it by boiling to one half. Let it rest for two days, and filter it afterwards in a bottle, wherein you keep it for use.

XCI. *To make the Still-de-grain, or Brown pink.*

Bruise and boil in three quarts of water, four ounces of French berries, to the reduction of one half. Strain all through a cloth, and put in this juice a discretionable quantity of whitening, pounded and sifted into a subtile powder, so as to make a thick paste, which put into small tied bags, and set to dry on tiles. When dry it is used with gum. And to render it finer, you may put some gamboge.

XCII. *To make a fine vermilion.*

Make a mixture of cochineal powder and burnt alum. Stifle it quite hot in rose or plantain water. It will give you the finest vermilion in the world.

XCIII. *A secret to draw without either ink or pencil.*

Rub a sheet of paper with tripoly. Then with any blunt point, form your drawing on it. Whatever you trace will be visible.

XCIV. *To make an imitation of enamel on tin, for chimney branches, &c.*

Get a sheet of block-tin very clean, and cut it in the form, shape, and figure you chuse to make your flowers and other things. Grind what colours you purpose to make use of, with clean water, and each separately, then let them dry. When you want to employ them, dilute them, each a part, with liquid varnish, and lay them on with the brush. Set the work in the open air for fear the colours should run, and when they are a little thickend and consolidated, finish drying them before a gentle fire.

XCV. *A valuable secret to make exceeding good crayons, as hard as red chalk, discovered by Prince Rupert, brother to Prince Palatin.*

Grind on the stone some tobacco-pipe clay, with common water, so as to make a paste of it. Then take separately each colour, and grind them, when dry, on the stone, so fine as to sift them through a silk sieve. Mix, of each of the colours, with your first white paste as much as will make it of a higher or paler hue, and embody the whole with a little common honey and gum-arabic water.

Note. You must be attentive to make crayons of various degrees of hues in each colour, for the chiaros and oscuros, or lights and shades. Then roll each crayon between two boards very clean, and set them to dry on paper for two days in the shade. To complete their drying lay them in the sun ; and then you may use them with satisfaction

XCVI. *To render the stone-cinnabar, and vermilion finer ; and at the same time to prevent them from blackening*

1. You raise the hue of the stone vermilion, if, in grinding it, you add gamboge water, tinged with a little saffron. This preparation extends only to the red.

2. With respect to the orange colour, you must add some minium to it.

3. For the yellow, put a discretionable quantity of orpine in cakes, prepared as follows:— Take the finest orpine you can find, and grind it well with water. Make it in little cakes, and set it to dry on paper. When dry, pulverise and use it.

4. For the gridelin, take French sorrel and boil it in water, to draw as strong a tincture from it as you possibly can. Then have white lead (dried in cakes, and prepared after the method abovementioned for the orpine) and grind it a-new with this sorrel tincture, then dry it Grind and dry it again, and repeat this operation with the sorrel tincture, till you have obtained the desired point of colour.

XCVII. *Process used in making Eastern carmine.*

1. Have a two quart glazed pipkin, quite new, wash it with boiling water, then fill it with water, very clean and filtered. Set it on blasting coals, and when it begins to boil, throw in a drachm of chouan in fine powder, which boil very quick for near a quarter of an hour. Then strain this water through a cloth washed in lye, but not with soap,

and receive it in another new glazed pipkin, washed as the first. Put this on a fire not quite so blasting as the first; and, when it begins to give signs of boiling throw in an ounce of the finest cochineal, pulverised very fine. Stir often with a hazel stick, stripped of its peel, and let boil gently for near a quarter of an hour; then throw in sixty grains of autour in subtile powder and keep it boiling for half a quarter of an hour. Take it off from the fire, and throw in sixteen grains of Roman alum in powder, then strain it immediately through a clean cloth, washed with lie, and no soap, and receive it in two different large china bowls, new and perfectly clean. Place these in a room, where they will be perfectly free from dust, and let them rest there for a week, that the carmine may have time to make a precipitation.

2. At the end of this term, decant out gently your tincture into two other china bowls, of the same size as the two former and as perfectly clean, taking great care in decanting, to do it so gently that the liquor may not carry the carmine along with it. Then dry in a shade the carmine, which is left in the bottom of your bowls, gather it with a little brush, and keep it very cleanly.

3. Eight or ten days afterwards, more or less, decant again the tincture which is in the second bowl into a new varnished pipkin, then dry and gather the carmine, which is at the bottom, in the same manner as the first.

4. Then set the pipkin, in which the carmine has been decanted for this second time, on the fire, and vaporise the liquor gently, till the ground remains in the consistence of a pap. This pap-like ground must then be put in several small china cups, and placed in the sun to dry, which will procure you again another carmine, darker, and much less valuable than the first. Should there happen any moistness on your last cups, take it off immediately, but gently, and with a great deal of care.

5. In order to take the water off from your china bowls, you might make use of another method, *viz.* a very fine and clean sponge in the following manner: Dip your spunge into very clear and pure water, and there work it well with your hand, soaking and pressing it alternately, till you have rendered it very soft. Then press and squeeze it dry in a clean towel. Now if you only approach it to the superfice of the tincture water, it will immediately fill itself with it, and you may squeese it into another empty bowl, thus repeating the same process, till you have got it all out of the first bowls; taking care every time you approach it to the surface of the water, lest it should touch the carmine; for no doubt but it would carry some along with the water.

6. If you dissolve one drachm of mineral crystal into

this tincture, by boiling it to that effect for five or six minutes, it will help a great deal the precipitation of the colour, from which you take out afterwards the water with a sponge, as we said before. Should the water you have thus drawn out be still tinged, you may add some more mineral crystal to it again; boil it as before, strain it through a cloth, and let it settle. By these means you will have very fine crimson carmine.

XCVIII. *The process observed in making the lake.*

1. Take one pound of Alicant kali, or Bril-ash, pulverised, which put in a kettle with four quarts of spring water. Boil the whole for the space of a quarter of an hour, keeping stirring all the while with a stick, then take it from the fire, and let it cool, so as to be able to keep your finger in it without scalding. When it is in that state, throw it in a jelly-bag, made of cloth, to filter it, and render it perfectly clear. Put it next in a new glazed pipkin, with one ounce of finely pulverised cochaneal, previously diluted by degrees with some of the same lye. Set it a boiling for half a quarter of an hour, and never cease to stir it with a stick all the while it is on the fire—You may, if you chuse, add one drachm of serra merita in fine powder, at the same time with that of the chochineal; it will render your lake the redder—When the whole shall have boiled the prescribed time, take it off the fire, and let the tincture cool, in order to pass it through a cloth, or the above mentioned jelly-bag. Set a large stone pan under the bag to receive the tincture which shall filter; and, when all is well drained, take the bag, turn it to throw off all the dregs, and wash it well, inside and outside, in clear water, and wring it quite dry.

2. Now hang again this same bag at two feet distance, or thereabout, above the pan wherein the tincture did run, and now is. Dissolve, in about two quarts of warm spring water, six ounces of Roman alum well pounded, that it may more readily melt. When this dissolution is no more than lukewarm, have somebody to pour it for you in the above jelly-bag, while you stir with a stick what runs from it into your tincture, and do so till the whole is passed through, and the tincture froths no more—Then wring well your bag again, to express all the alum's dissolution from it into your tincture, and wash it again afterwards in clear water, as before.

3. Have another stone pan like the first, hang your bag again over it, and pour all your tincture in it. If it run clear like water, you may then let it go so; if not, put it again in the bag over the other, and continue so to do till it absolutely does run clear.

If, however, after having repeated this three or four times, it should continue to run tinged, dissolve two or three ounces more of pulverised Roman alum in about two quarts of that tinged water, then stir and mix it well in the whole quantity of tincture, then pour it again in the bag where the lake is, re-pouring again and again what shall run first from it, till it runs quite clear, and does not even stain the paper.

4. Then let drain well the lake which is in the bag; and with a box-spoon take it, and spread it on pieces of cloth, laid on plastered stones, and let it dry, in the shade where there is no dust, or where, at least, you may preserve it from any.

XCIX. *To make the fine columbine lake.*

1. Take half a pound of the finest Brasil wood you can find. Cut it in small bits, and pound it in an iron mortar. Put this in a new glazed pipkin; pour over it two quarts of strong wine vinegar. Let this infuse without the assistance of any heat for three whole days. Boil it next for half an hour; then add one ounce of pulverised Roman alum, and boil it again for the space of three quarters of an hour, that the alum may the more perfectly be dissolved, and the stronger the colour.

2. Take the pot off the fire; and rasping the softest part of a dozen cuttle-fish bones, add this powder to it. Replace the pot on the fire, and stir the contents till you see a froth rising on the composition; when immediately taking the pot off from the fire again, cover with its lid, and let it stand for a week. During that space of time you must, however, carefully stir this matter four times a day.

3. Have next a glazed pan, filled with dry sand as high as three finger from the brim. In this sand put your pot half way in. Place all on a charcoal fire, till it nearly boils; then, taking the pot off from the fire, run the liquor through a clean cloth. Put it in different retorts, and set them half way in the sand again, which, by this time, ought to be quite cold. Replace all on the fire as before, and keep it there till it begins to simmer; then taking it from the fire, let it cool, and the lake is done. But it must not be used till twelve days after.

Note. When the tincture is in the retorts, you may put in each of them half a gill of lye, made with vine branch ashes. When you put the powder of cuttle fish-bones in the tincture, you must take care it is warm. The residue which is found at the bottoms of the retorts ought not to be thrown away, as it is very good to paint in water colours.

C. *A fine red water, for miniature painting.*

1. Put in a new glazed pipkin one ounce of *Fernamburg Brasil* wood, finely rasped. Pour thee pints of spring water on it, with six drachms of fine white isinglass chopped very small Place the pot on warm ashes, for three days, during which you are to keep up the same degree of heat.

2. When the isinglass is melted, add two ounces of kermes in grain, one of alum, and three drachms of borax, well pounded. Boil this gently to the reduction of one half; then strain the liquor through a cloth, bottle and stop it well, and set it in the sun for a week before using.

Note. This water may very properly be used as a wash to give an agreeable bloom to pale faces.

CI. *The receipt of the fine Venitian lake.*

1. Take one pound of good pearl ashes. Put it in a large copper; then, pour over it six gallons of spring water. Let the pearl ashes soak thus twenty-four hours, after which, set the copper on the fire, and boil it for one quarter of an hour. Then filter through a cloth jelly-bag, and receive the filteration in a stone pan.

2. If not quite clear, filter it till it is; changing the pan only underneath, pour what ran thick in the bag again. When all is new filtered and clear, put in the copper again, which must have been previously washed, and set it on the fire to boil. When it boils, throw in two pounds of fine scarlet flocks which boil to whiteness Then filter again this lye tinged with scarlet colour, in the beforementioned jelly-bag, and press well the flocks, that there may not remain any colour in them.

Observe that your bag may serve both for the lake and tincture, without being at the trouble of cleansing it, you must not filter through it the second lye in which the scarlet is For should you pour this lye from your copper, directly into it, the scarlet flocks would undoubtedly run with the lye, which would give you an infinite deal of trouble to get out the bag, after the filtering of the tincture. And the least bit of it would entirely spoil the lake; to avoid all these inconveniencies, strain your second lye either through a cloth, or another bag by itself

3 While the tincture is filtering, get the copper well cleaned, and wiped dry. Put the filtered tincture in it. Dissolve, over the fire, in a glazed earthen pan, half-a pound of Roman alum in one quart of spring water Then strain it quickly, and while warm, pour it in your tincture, keep stirring all the while, and afterwards, till all the froth has quite subsided. Boil next altogether for the space of half a quarter of an hour. Then throw it in the

same bag, that filtered your first lye, and receive the filteration into a clean stone pan

4. Besides this: boil again, in another quart of spring water, half a pound of Fernamburg Brasil wood, cut and bruised in an iron mortar. Strain it through a cloth, and pour it along with the above dissolution of Roman alum in the jelly-bag, and stir it to run altogether.

5. After all is run out of the bag, throw in again half a pint of quite clear and pure spring water.

6. When nothing runs any more out of the bag, the lake is left in it. Take it out with a box-spoon, and spread it on plaister flat stones, three fingers thick, and about half a foot square, covered with white cloth of the same size. For should there be no cloth on the plaister, the lake would stick to it.

Note. It often happens for the first water which runs out of the bag to be muddy, and to carry some lake along with it. But you must continue filtering till it comes bright and clear. Then taking off the pan from underneath, and substituting another, put that muddy liquor into the bag again. Should the filtration by chance continue to run red, as it sometimes happens, you must still keep filtering the liquor through the bag, till it is clarified.

CII. *Directions for co'ouring prints.*

1. All the colours which are used for colouring prints are grinded with gum water; the calcined green only excepted, which grinds with vinegar.

2. The chief of these colours are, fine azure, vermilion, Venetian lake, fine verditure, white lead, calcined green, umber, Cologn earth, indigo, French berries juice, yellow ochre, yellow-massicot; white massicot, brown ochre, bistre, prepared soot lamp-black, and brown red.

3. For complexions, make a mixture of white and vermilion, more or less, according as you want the colour For the lips, it is a mixture of lake and vermilion, and the shades are made with white and vermilion, and a great deal of umber.

4. For fair hair, join a good deal of white with very little umber. If a carrotty colour, take yellow ochre and brown red; the shade with bistre and lake mixed together If light, only mix some black and white and umber together.

5. Clothes, are made, if linen, with white lead and a little blue; if stuffs, with white lead alone, and the shades with a grey colour, made by means of a mixture of black and white lead together. If a white cloth, you must make a mixture of white and umber together, and shade it with a compound of umber and black. If a red cloth, use vermilion in the lighter parts of the folds, lake and ver-

milion for the clear shades ; the lake alone laid on the vermilion, will form the dark shades.

CIII. *Directions for the mixture of colours.*

1. The pale yellow for the lights, is made with white massicot. The chiaro oscuro, with the massicot and umber. The dark shade with umber alone.

2. The orange colour is made with black lead for the lights, shade with the lake.

3. The lake is used very clear for the lights, in draperies, and thicker for the shades.

4. The purple is made with blue, white, and lake, for the lights ; blue and lake only for the clear shades' and indigo and blue for the darker ones.

5. The pale blue is used for the lights, and for the clear shades a little thicker ; but for the darker shades, mix the indigo and blue together.

6. The gold like yellow is made with yellow massicot for the lights ; and the clear shades with a mixture of black lead and massicot ; the darker shade with lake, yellow ochre, and very little black lead : and the darker of all, with Cologn earth and lake.

7. The green is of two sorts. The first made with massicot and blue, or blue and white ; and for the shades, make the blue predominate in the mixture. The other is made with calcined green ; and French berries juice, mixed and calcined green ; and you may form their shades by addition of indigo.

8. For trees you mix green and umber together.

9. The grounds are made in the same way ; wherever there is any green, take calcined green, with French berries juice.

10. For the distance, mix green and blue together ; and mountains are always made with blue.

11. The skies are likewise made with blue, but you must add a little yellow to them, when it comes near the mountains to make the transition between that and the blue mix a little lake and blue together to soften it.

12. Clouds are made with purple ; if they be obscure ; you must mix lake and indigo together.

13. Stones are made with white and yellow mixed together, and their shades with black.

CIV. *Directions for painting* fresco.

1. Lay on the intended wall a coat of rifted silver sands, mixed with old slack lime, pulverised and sifted also. This coat is not to be laid on the wall, but in proportion

as you paint: therefore prepare no more at a time than you are sure to paint over in one day, while fresh and moist. The body of the wall on which you lay this coat must previously be pargetted with plaister, or mortar made with sand and lime. And if the paintings are to be exposed to the injuries of the weather, the mason's work must be made of brick or freestones very dry.

2. Before you begin to paint, you must prepare your designs in their full intended size, on paper, and chalk them one after another on the wall, in proportion as you work, and no longer than half an hour after the coat of prepared river sand has been laid on, and well polished with a trowel.

3. In these sorts of paintings all the compounded and artificial made colours as well as most of the mineral ones, are rejected. They use hardly any other but earths, which may preserve their hue and defend it from being burnt by the lime. And that the work may preserve its beauty, you must employ them quickly while the coat underneath is still moist; and never as some do; touch them over after they are dry, with colours diluted in yolks of eggs, glue, or gum, because these colours always blacken, and never keep that vivacity and brilliancy those have which have been laid at first when the ground was moist. In the case of paintings exposed in the air, this sort of touching up is is never good, and too often scales off in a short time.

CV. *Directions for the choice, use and composition of the colours employed for the above purpose.*

The colours made use of for the above purpose, are such as follow.

1 The white is made with a lime which has been slacked for a great while, and white marble in subtle powder, mixed in about equal quantities. Sometimes no more than a quarter part of the marble dust is required, which depends entirely on the quality of the lime, and cannot be known but when you come to use it; for if there be too much marble, the white will turn black.

2. Ochre or brown red, is a natural earth.

3. Yellow ochre is also a natural earth, which becomes red if you burn it.

4 The obscure yellow, or yellow ochre, which is also a natural earth, and slimy, is to be got by the streams of iron mines. It receives a fine colour from calcination.

5. Naples yellow, is a sort of filth, which gathers round the mines of brimstone; and though it be used in *fresco* paintings, its colour nevertheless, is not so good as that which is made of earth, or yellow ochre and white mixed together.

6. The purple red is a natural earth, the product of England, and is used instead of lake.

7. The *tervete* from Verona in Lombardy, is a natural earth which is very hard and dark. There is also another sort of *terverte*.

8. The ultramarine, or *lapis lazuli*, is a hard stone, and of a difficult preparation. This colour subsists and keeps itself fine much longer than any other colour. It is not to be ground, but diluted only on the pallet with oil. As it is very dear, you may spare using it in *fresco* paintings, and supply it by smalt, which answers the same purpose, particularly in skies.

9. Smalt is a blue-colour, which has a very little substance. It is used in great landscapes, and stands very well the open air.

10. Umber is an obscure earth. It requireth to be calcined in an iron box, if you want to make it finer, browner, and of a better look.

11 Cologn earth is a sort of rusty black, which is apt to discharge, and turn red.

12. The earthen black, is a black which comes from Germany. There is another sort of German black, which is a natural earth, and makes a bluish black, like that of charcoal. This sort of black is that which is used for making printer's ink. There is another still, which is made with burnt wine lye.

Such are all the colours, which are preferably to be used in *fresco*-painting. Grind and dilute them with water. Before beginning to work, prepare your principal colours, and put each by themselves, in small gallipots. It is necessary to know that except the purple red, the brown red, the yellow ochre, and all the blacks, (those particularly which have passed through the fire) turn paler as the *fresco* dries.

CVI. *Directions for painting in oil on a wall.*

Method 1.

You must when the wall is perfectly dry, give it two or three coats of boiling oil, or more, if necessary, so that the face of the wall may remain greasy, and can soak in no more; then lay another coat of ficcative colours, which is done as follows. Grind some common whitening, or chalk, red, ochre, and other sorts of earth, pretty stiff, and lay a coat of it on the wall. When this is very dry, then draw and paint on it whatever you will, observe to mix a little varnish among your colours, that you may not be obliged to varnish them afterwards.

CVII. *Method* 2.

In order it may sooner dry, and that the dampness should not occasion the colour to scale, as it sometimes happens, on account of the oil which resists it, make a cement with lime and marble dust, or tiles; this lay on the wall with a trowel, smoothen it, and then give it a coat of lintseed oil, with a large brush. In the next place, prepare a composition of Greek pitch, mastich, and coarse varnish, which boil altogether in a pipkin, and lay afterwards, first with a brush then smoothen with a hot trowel, in order to spread it more equally. When this is done, lay on a coat of ficcative colours above mentioned, then draw their design and paint.

CVIII. *Method* 3.

Others again make a cement, or mortar, with lime brick-dust and sand. And when this is dry, make another with lime, sifted brick dust and smith's embers, or iron scum, all in equal quantities. Beat and incorporated together, with whites of eggs and lintseed oil, and it will make so strong a cement as cannot be equal by any thing. Its nature is such, that while you are laying it on, you must not stop and leave it till you have finished, otherwise it will assuredly crack in every one of those places where you resumed your work. Therefore go on till the whole wall is entirely covered with it, and totally polished. And when dry lay the abovementioned coat of ficcative colours, and proceed according to the other directions.

CIX. *Directions for painting in oil on wood.*

Lay first one coat of size on the wood; then another of whitening diluted with size, then another again of boiling oil. When this last is throughly dry, you draw your design and paint as usual.

CX. *Directions for painting in oil on canvas.*

1. Chuse a fine and smooth tick or cloth, which nail on a frame. Pass over it first a coat of size, and when dry, rub it over with a pounce stone to eat off all the knobs and knots. The size which you put first on the cloth is intended to lay down all the threads, and fill up all the small holes, that the colour may not pass through

2. When the cloth is dry, lay on a coat of simple colour, which may not destroy the others; for example, brown red, which is a natural earth, full of substance and lasting.

You may mix it, if you like, with a little white lead, it will dry the sooner To grind this colour, they use nut, or lintseed oil, and in order to lay it as thin as it is possible, they use a large knife made on purpose.

3. When this colour is dry, you are to rub it again with the pounce stone, to render it smoother. Then lay another coat of white lead and charcoal black, to render the ground greyish. In this as well as the preceding coats, you must take care to put as little colour as you possibly can, to prevent the cloth from cracking, and for the better preservation of the colours which are to be laid afterwards in painting. For it is proper to observer, that could there be no ground at all laid on the canvas of a picture, previous to the painting of it, and should one paint directly on the bare cloth without any other preparation, the colours would appear much more to their advantage, and preserve their brightness much longer. A proof of this assertion may be found in the practice of *Paul Veronese* and *Titian*, who used to impregnate their canvas with water colours only, and paint afterwards in oil over that ground. This custom has not a little contributed to render their pieces more lively and bright, because the ground in water colours draws and soaks the oil off the colours, which must render them much finer, as the greatest cause of their dulness arises only from the oil, with which they are diluted.

4. They, therefore, who wish to see their works keep bright and lively, use as little oil as possible, and keep their colours more stiff, mixing a little oil of spike amongst them, which indeed vaporises very soon, but assists in rendering them more fluid and tractable in working.

5. Another cause of the colours not keeping a long while their beauty is, when they are too much tormented on the pallet as it often happens that painters confuse them in working. Whenever this is the case, they must needs be hurt, as there are many which adulterate and otherwise corrupt the others and spoil the vivacity of their teint. We cannot recommend too much to be cautious and clean in employing them, taking care to lay them as distinct and separate as possible, each by themselves, on the pallet, without mixing them too much with the brush or pencil. Never mingle together those colours which are enemies to each other, as all the blacks are, particularly, the lampblack ; but as much as possible try to use them separately. When there is occasion of giving more strengh to some parts of a picture, stay till it is dry before you touch it up again, if those colours are obnoxious to the others with which you are to do it. There he shews his judgment in painting, who is not precipitate

in laying his colours on his pictures, but lays them thick enough, and covers at several times the carnations, which in terms of art is called *empater*.

6. As to what concerns the first laying of grounds on canvas, in water colours, it is a method not commonly practised, because they may scale, and cannot be rolled without some difficulty. For this reason, the custom prevails of grounding the canvas with oil colours. But when the canvas is good and very fine, the less colour you can lay on for that purpose the better. Take care only those colours and oils are good. The lead which some painters use to help their colours to dry the sooner, soon destroys their brightness and beauty.

CXI. *Which colours are used for the above purpose.*

1 Though all the different sorts of colours which are used in painting in oil are not fit for that called *fresco*, yet it is true, that (except lime and marble dust, which cannot strictly be called colours,) every one of those used in *fresco* are good in oil.

2. White lead is made with lead which you bury. Several years after this lead turns into some sorts of flakes, which are of a very fine white. Though this white exists in painting, and is in positive use, it has, however a very bad quality, which the oil corrects a little when you grind it on the stone.

3. Cerase, or flake white, is a sort of rust or gathered from lead, but of a coarser nature than the other.

4. Massicot; there are two sorts of this colour. The one is yellow, and the other is white. It is made with calcined lead.

5 Orpine, otherwise auripigment. Is used calcined and non-calcined. To calcine it, they put it in an iron box, or in a pot well stopped. But few either calcine it, or even use it at all, the fumes are mortal, and it is very dangerous to use it.

6. Black lead comes from lead mines. They make very little use of it, because it is a bad colour of itself, besides that, it is a great enemy to the others.

7. Cinnabar, or vermilion, is drawn from the mines where they gather quicksilver. As it is a mineral, it is the reason why it does not resist the impression of the air, nor the injuries of the weather.

8. Lake. This colour, which is an artificial made one, is composed with cochineal or with scarlet flocks; or again, Brasil-wood, and some other sorts of woods. There are several sorts of lake made. It does not stand the weather.

9. Blue verditure and green verditure is very seldom used in any other works but landscapes.

10. Indigo. This colour is generally used for making skies, or draperies; when properly used, its keeps its beauty a great while. You must not mix it with too great a quantity of oil, but lay it a little thick and dark, because it discharges very much. They use it with great success, diluted with gum water. It is a good colour for the composition of greens.

11. Brown pink, otherwise called *still-de grain*. This colour is drawn from what is called French berries, which they soak and boil, then mix the result with vine-wood ashes, or calcined white chalk, to give it a proper consistence. When this is done, it must be strained through a very fine cloth.

12. Lampblack. This is a bad colour, but handy to paint black draperies

13. Ivory black. This black is made indifferently with common bones, as well as ivory burnt. *Appelles* discovered this sort of black, if we believe *Pliny*, book. xxxv. chap. 5.

14. Verdigrease is the most pernicious of all the colours, and capable to ruin a whole picture, if there were never so little in the colour with which the canvas is first impregnated.—It is however of a very agreeable look. They sometimes calcine it to prevent its malignent effect; but it is as dangerous to use it that way as orpine; and it is an undoubted truth that, however well prepared it may be, it must be employed by itself, for it would spoil all the colours with which it may be mixed. It dries very much, and for that purpose they mix a little of it with the blacks, which can never dry without some assistance.

N B. You must be very careful never to use, for other colours, the pencils with which you shall have laid any verdigrease.

15. There are again some other sorts of compound colours which are never used but in oil.

CXII. *Which oils are used in painting.*

1. The best oils which are used in painting are those of nut and lintseed. To render the colours more fluid, and spread more easily under the pencil, they use also oil of spike. This oil absorbs itself in the canvas, and leaves the colours without any gloss. It is made with the flowers of a plant called spikenard, or lavender spike.

2 There is another oil drawn from Melezian, rosin, firs, &c wherefore it is called oil of turpentine. This oil is very good for touching up pictures; but it is chiefly good for mixing with ultramarine, and the different sorts of smalts, because it serves to make them spread with more facility,

and evaporatesal most immediately. When you make use of this oil, the less there is of any other oil in the colour the better, as they all serve only to make it turn yellow.

3. There are other oils again which are denominated ficcative oils, because they serve to dry up the others the sooner. These are many in number and species. One sort is nothing but the oil of nut, boiled with gold litharge and a whole onion peeled, which is taken off after boiling; this onion serving only to exsiccate the greasy parts of the oil, and to clarify it. Another sort is made with azure in powder, or smalt, boiled in oil of nut. When the whole has boiled, you must let it settle, and then skim off the top It is fittest for diluting the white, and such of the other colours as you want to preserve purest and neatest.

CXIII. *To take off instantly a copy from a print, or a picture.*

Make a water of soap and alum, with which wet a cloth or a paper; lay either on a print or picture, and pass it once under the rolling press; then going round the other side to take it up, you will have a very fine copy of whatever you shall have laid it upon.

CXIV. *Directions for making the Spanish carnation.*

Take bastard saffron, wash dry, and grind it well. While you grind it, put in four ounces of pearl ashes to every one pound of saffron. Incorporate them well both together, and throw it into a double cloth jelly bag. Then set a half a pint of Spanish lemon juice on the fire, and when just lukewarm, pour it on the saffron in the bag, and lay under it what you want to dye. The stuff which is to be dyed ought previously to have been boiled in alum water, then rinsed and wiped between two clothes, as a preparatory process to make it take the dye better.

CXV. *To make the Spanish ladies* rouge.

Vermilion, carefully laid on a sheet of paper, from which, by means of wetting the tip of your finger with your spittle, then take it off at will, and rub your cheeks, lips &c. The method of making it is as follow.

1. Take good scarlet flocks and spirit of wine, or in their stead, lemon juice. Boil the whole in an earthen pot, well glazed and well stopped, till the spirit of wine or lemon juice has charged itself withal the colour of the scarlet flocks.—Strain this dye through a cloth, and wring it hard, to express well all the colour out. Boil it afterwards with a little arabic water, till the colour becomes very deep.

2. On half a pound of scarlet flocks you must put four ounces of spirit of wine, and a sufficient quantity of water, to soak well the flocks. Then in the colour you extract from it, put the bulk of a filbert of gum arabic, and boil the whole in a silver porringer. When this is ready, as we said before, proceed as follows.

3. Steep some cotton in the colour, and wet some sheets of paper with it; then let them dry in the shade Repeat this wetting, drying of the same sheets over again, many times, till you find they are charged with *rouge* to your satisfaction.

CXVI. *A fine lake made with shell-lac.*

1. Boil and skim well, sixteen pounds of chamber-lye; then put in one pound of fine shell-lac, with five ounces of roch alum, in powder. Boil all together, till you see the chamber-lye is well charged with the colour, which you may easily know by steeping a bit of white rag in it; then take it out again, to see whether or not the colour please you; and if it do not, let it boil longer, repeating the same trial, till you are perfectly satisfied.

2. Throw now the liquor in a flannel bag, and without suffering what runs into the pan under to settle, repour it into the bag so many times, till the liquor runs at last quite clear and not tinged Then with a wooden spatula, take off the lake, which is in form of curd, form it into small cakes, or balls, and dry them in a shade on new tiles; then keep them for use.

CXVII. *Directions to make cinnabar, or vermilion.*

1 Put mercury (or quick silver) is a glazed dish. Set it on a sand bath, and let it be well surrounded with the sand every way. Pour some melted brimstone over it, and with an iron spatula keep constantly striking, till the whole is coverted into a black powder.

2. With this powder, fill the quarter part of a retort with a short and wide neck. Place it first on a fire of cinders. Increase the fire by degrees, and continue it for ten hours; after which, make a blasting one for twelve hours.

3. Observations.—By the first fire, there will arise a black fume.—By the second, a yellow.—And by the last, a red; which signifies the perfect accomplishment of the cinnabar.—As soon as this is the case, let the vessel cool, and you will find in the receiver, and in the neck of the retort, a very fine cinnabar.

N. B. Many, instead of a glass retort, use earthen, or stone which all equally bear the fire. Make a slow fire for

about half an hour, then increase it till the red fumes arise. Both methods answer the same purpose.

CXVIII. *Another method of making cinnabar.*

1. Melt brimstone in a pipkin over a slow fire, then take it out, and with one hand squeeze a knot of murcury between your fingers through a cloth into the melted sulphur; and with the other, stir well till the lump is become quite cold and black.

2. Put this into a subtile powder, with which having filled the fourth part of a very long retort, lute it well, and very exactly, with a good lute. Place it next, without a receiver, for two or three hours, on a very mild fire; then introduce into the retort a long funnel, which will reach to the bottom of the retort, through that funnel pass a long spatula, which touching also the bottom of the retort, should come out of the funnel five or six inches. In the middle of the spatula let there be a bung of lute round it, well dried, which will stop so well the retort as to prevent it from breathing any air. When all this is done, push on the fire to a pretty smart degree, and keep it for five hours.

3. At the end of this term, draw out the spatula, and introduce, through the same way that it came out, two spoonfuls, or thereabouts, of your prepared powder of brimstone and quicksilver, with which you intend to make cinnabar, which for that purpose, have kept warm in a vessel by the corner of the fire, that it may not cool the retort in going in, and thereby retard the operation.

4. Continue so to do, adding ever hour new matter, by means of the drawing out the spatula to introduce the new powder, and replacing it quickly, till you have increased your lump of cinnabar to the quantity of one hundred weight. The spatula's use in the neck of the retort is to prevent its filling itself up by the sublimation of the matter, which would occasion two evils, that of breaking of the retort, and of preventing the introduction of new powder to increase the lump of cinnabar. So that at the same time it keeps a free passage into the retort, it nevertheless stops, it too, by means of the ball of lute which is round it. But in the last place, in order there should remain no vacancy in the middle of the cinnabar-lump, take off the spatula for the last time, and inject fresh powder; then, without reintroducing the spatula, stop the retort with a lump of lute only. Thus the longer you keep the fire up, the harder and redder the lump of cinnabar becomes.

5. Observations.—This cinnabar is the very same which empirics use in fumigation, along with aloes wood,

myrrh, and other aromatics, to excite the mouth, or belly flux, which they reiterate two or three times, or till that flux, is abundant enough to procure the cure of the veneral disorder It is the same also which painters make use of, and which enters into the composition of sealing-wax.

CXIX. *An azure as fine as, and which looks similar to, ultramarine.*

Grind well together into powder three ounces of ammoniac salt, and six of verdigrease. Then wet it continuing to grind it with oil of tartar, till you have made it pretty fluid. Put this into a glass matrass, and bury it five days in hot dung. At the end of that term you will find your composition turned into a fine azure.

CXX. *The same, as practised in Germany.*

1. Distil in an alembic, one pound of vitriol, half a pound of nitre, and three ounces of cinnabar. In this water put tinsel or copper; they will dissolve. When the dissolution shall be perfected, add a sufficient quantity of calcined pewter to render your liquid quite milk-white Let the whole rest for three days, and then you will have a middling azure.

2. The liquor which stills, from the vitriol, cinnabar and nitre, has the power to dissolve any sort of metal whatever. It has again this additional virtue, that if you rub the forehead of a horse with it, the hair will instantly turn, and remain white at that place.

§IX. PREPARATION OF THE LAPIS LAZULI, TO MAKE ULTRAMARINE.

CXXI. 1*st*. *The general manipulation of the whole process: each single part of which shall be treated of in particular afterwards.*

1. Take one pound, or whatever quantity you please, of *lapis lazuli* Let your stones be well chosen, and of that sort which are streaky with gold. Try their quality whether good or bad, which is done thus. Break one bit of it, set it on red hot coals, and blow as hard as you can for an hour, then take it off and let it cool. If in touching it, it drop like mould or dust, it is a sign it is not worth any thing; but if it remains hard and preserves its colour, it is good. When you have thus made yourself sure of the quality of the stone, break it all in small knobs, put them

in a crucible on a melting fire, which by strength of bellows you push on for an hour and a quarter. Then throw them into the strongest double distilled wine vinegar. When they are thus extinguished, take them out to dry, and prepare the following water.

2. Boil a little raw white honey, with two pints of water, in a glazed pipkin. Skim it so long as there comes any scum on it; then take it off to cool; and, when cold, dissolve in it the bigness of a nut of the best dragon's blood, reduced into a subtile powder. Run this dissolution through a white cloth into a glazed earthen pot. Observe to make your water (with that dragon's blood) neither too red, nor too clear, but to keep a just medium between both, that the azure may take a finer hue. With this liquor grind, for the space of an hour and a half, the above mentioned *lapislazuli*, then gather it into a large glazed vessel, let it dry in the shade, but guard off the sun, otherwise it will undoubtedly lose its colour. When it is perfectly dry, grind it a-new into a very fine powder, then pack and keep it tied very closely in fine white linen. Then proceed to the following paste.

3. Take two ounces of the best white rosin, an equal quantity of Greek pitch, and the same quantity again of mastich, lintseed oil, turpentine, and virgin wax. Powder what is powderable, and cut small what is not. Put all into a new glazed pipkin, and boil it to perfection; which you know by letting a drop fall into cold water, and taking it out with your fingers. For if it do not stick to your fingers, it is done to perfection. When it is done to perfection, run it quite hot through a sheer cloth into a pan of cold water, wherein leave it till perfectly hard; then take it out and let it dry. When you want to incorporate it with the powder, proceed as follows

4 Cut this paste into small bits, and put it to melt over the fire in a well tinned saucepan. When the contents come to make a noise, throw in two ounces of oil of bitter almonds, and let it boil for about ten minutes. In the mean while have your *lapislazuli* powder ready in a vessel, then pour over it gently, and little at a time, what is boiling in the pipkin, observing to stir carefully while you pour, in order to incorporate well this liquid with the powder, which being done let the whole cool. Then, having rubbed your hands with oil of olive, take this composition and work it well in order to incorporate all perfectly; and, after having given it the form of a loaf, put it in a glazed vessel to keep it for use.

5. When you want to draw the azure from it (which must not be less than twelve days after this last operation) begin first by making a strong lye with wine wood ashes, which you strain through a flannel bag, to get it very clear. Then, putting it in a copper boiler, on the fire, till it is so

hot as not to be able to keep the hand in without scalding, you pour some of it on what quantity of the above paste you please, to extract the azure from, and stir it gently till it begins to come out. When, by thus stirring your past in this lye, this last is become well charged with the colour, decant it out with another glazed vessel, of which sorts of vessels you must have a good provision ready. Then pour again some more warm lye on your paste, and work it the same as before, till this new lye seems sufficiently charged with teint, and decant it out again into another well glazed vessel. Pour new warm lye again on your paste, and proceed as before, continuing so to do till the paste gives no more teint to the lye.

5. Observe, that when the lapis is good, you loose but four ounces of it out of one pound, and that you extract twelve ounces of azure in the following proportion. Five ounces of very fine ultramarine, by the first washes; four middling, out of the second, and three base ones, by the last. Each of the different qualities must be kept separately, and washed in several clear lyes, by changing them from vessel to vessel several times, with new lye each time. And when they seem to you very bright, put them a-drying in a shade; but not in the sun, in a room perfectly free from dust.

7. When it is dried, take a glass of brandy, in which you have put a soaking a little Brasil wood, and asperge the ultramarine with that tinged brandy, stir it, and let it dry; renew the aspersion for two or three days, till the azure participates a little of this teint. When it is well dried, for the last time, you will find it to be of a most beautiful hue. Then put it in small leather bags, and keep them well tied.

CXXII. 2d. *Directions to be observed in the process of preparing the strong cement in which the* lapis lazuli *is to be incorporated, to draw afterwards the azure from it.*

1. Take first, clear and neat Venetian turpentine, four ounces; fine white rosin, six; fine Greek pitch, as much; clear and pure mastich, three; fine shining white wax, an equal quantity; purified lintseed oil, one and a half. Then have a well glazed pipkin, quite new; put in it first the turpentine and set it on a small and mild charcoal fire. Stir it with a wooden spatula, like that of apothecaries, till it is well liquified; introduce, next, the rosin to it, by little and little at a time, and incorporate it well; when this is done, add the Greek pitch to it, in the same manner, then the mastich in powder, at three or four times; then the wax cut very small, also by degrees, and stir well till the whole is perfectly incorporated to-

gether. Above all, take care to do this with a slow fire, otherwise these matters will undoubtedly burn, as they are of an inflamable nature At last put the lintseed oil, and set the pot on the fire, and let the composition simmer till the cement is quite done which you know by the following experiment.

2. Turn the spatula all round the pot in the composition, then rising it out, let a drop or two fall into a pan of cold water. If the drop spread on the water, the composition, is not done, therefore you must let it simmer longer on the fire. If on the second trial the drop keep in one lump, the matter is done.

3. When the cement has acquired a tolerable degree of coldness in the water, take it out in a lump; and with your hands imbibed with lintseed oil, prepared and purified, as hereafter directed, for fear it should stick to them, work it so well, that there shall remain no more water about it. When this is performed, the cement is perfectly completed; and to preserve it, keep it perpetually in cold water. Therefore, in summer, you must change that water every day, and with such precautions, you may preserve it eight or ten years always good for strong cement.

CXXIII. *Another cement of a softer nature.*

1. Take fine Venice turpentine, four ounces; fine white rosin, six; Greek pitch; as much fine wax, one; and lintseed oil, three parts of an ounce. Prepare this cement after the same way as the other; and observe carefully in the doing of it the same order.

2. Observe, that this sort of cement is sooner done than the first, and that it will sooner return you the azure than the first, which is harder, will do. But neglect not, if you intend to work the *lapis lazuli* with both these cements, you must begin with the soft first. And yet you are not to be kept ignorant, that if your *lapis lazuli* be not of the best sort (which is the gold streaked sort) you must guard well from giving it the two cements. In the art of preparing and giving the cement or cements, consists entirely that of making the ultramarine azure; in that point lies all your gain or your loss. Therefore take great care to do it well.

CXXIV. *Directions to prepare and purify the lintseed oil for the azure.*

1. Take whatever quantity you will of fine lintseed oil, of a fine saffron or gold colour. Put it in a glass, or bul-

lock's horn perforated at the small end. Pour over this oil some cold water, and stir it well with a stick, to mix it well, then let it settle. When the oil and the water, are divided, open the little hole which is at the bottom of the horn, and let the water out. Put some fresh water and repeating the same process seven or eight times, till the water runs off as clear as you first put it in.

2. Thus your oil shall be perfectly purified ; and in that state you may keep it in a well stopped glass bottle for use.

3. The oil of bitter almonds may absolutely supply the want of this ; but besides its being dearer, it is not near so good for the purpose.

Note. That whenever we shall speak of oil, we always mean lintseed oil thus prepared and purified.

CXXV. *The lye to wash the ultramarine with.*

1. Take eight or ten handfuls of pearl-ashes, made with vinewood ashes. Put this into a box perforated at the bottom, and large enough to hold a couple of pailfuls of water. Place this basket, and set it so that the water cannot run out of it without carrying the ashes along with it. Stop the whole on the outside, before putting the ashes into it, and press these down very hard, then pour, by degrees, a pailful of warm water over these ashes. When these are settled again, unstop the hole, and put a bung, made of an old list of white cloth, through which you will make it run drop by drop into a pan. Repeat this distillation again, by putting this same lye into another perforated box, without any ashes, and stop it with another bung of the same kind as the first, so that you may get your lye fine and clear ; and put it to keep in a well glazed vessel, carefully covered, for fear of the dust.

2. Now pour another similar quantity of warm water on the same ashes as before ; proceed exactly with this second water as with the first, and keep these two sorts of water for use.

3. Repeat again the same operation, by pouring a third pailful of water on the same ashes, and proceeding in every respect as with the two former, you will be possessed of three sorts of lye, of three different degrees of strength.

4. These various sorts of lyes serve to wash the cement or paste in order to draw the azure out, after the method hereafter prescribed. When you want to proceed to work, take of these three different sorts of lye, and mix them so as to give them the due degree of strength, according as you think requisite.

CXXVI. *Another sort of lye for the same purpose.*

There is another sort of lye which can be made to cleanse the cement of its unctuosity and grease, and which they prepare in the following manner.

1. Take whatever quantity of calcined tartar you like—Boil it for a quarter of an hour in a clear water Then let it settle, and decant it into a glass bottle, stop it well, and keep it for use.

2. It is fit for taking the grease off the cement when too unctious. Likewise to wash all the *ultramarine* with, and thereby heighten its colour.

3. This lye has also another particular quality, which is that of curing the mange, the itch, and other cutaneous disorders, by washing with it. It purifies and whitens the skin prodigiously.

CXXVII. *Directions for the choice of the vessels in which the most impure ultramarine is to be washed, in order to be mixed afterwards with the other azure.*

1 The vessel, if it be an earthen vessel, should be well hardened in the baking, and finely glazed in the inside, or if of brass or copper, should be of a perfect polish all round, and at the bottom, in the inside.

2. It must be perforated by the side with three holes, to admit of three cocks,one toward the middle part, the other lower, and the third at two fingers breath from the bottom.

3. Though the azure matter which is at the bottom of the vessel appear not to you to be such, let it rest eight or ten days, and you will be convinced of the contrary. When you plainly perceive somewhat of azure at the bottom of the water, decant it out as gently as possible ; take out that azure, wash it with clean water ; and you will find it as good as the rest.

CXXVIII. *Observations for discerning the good or bad qualities of the* lapis lazuli, *from which you intended to compose ultramarine.*

1*st. Trial.* Wet first the *lapis lazuli* with common water. and wrap it up in a piece of fine white cloth or serg. It will thereby become of a fine lustre, and purple colour, very agreeable to the sight.

2*d Trial* If you want to know whether or not it be fine, set it on blasting charcoals, and blow them continually for a good while. Then take it off from the fire. If, being cold, it has not lost much of its colour, it is fine ;

but if it has lost none of its colour, none can be finer. For the *lapis* which is of a superior degree of fineness, acquires instead of loosing colour, when put to this trial.

3d. Trial. For the third experiment, put the *lapis* a reddening on an iron plate over the fire; then extinguish it in the best double distilled white wine vinegar. If by this trial it acquire more colour, it is too fine; if it only keep its own without any alteration, it is good and such as you can wish to have it. The *lapis*, which on that trial acquires more colour, may be worth between thirty and forty shillings an ounce. But that which keeps its own natural colour after trials, is really scarce As to that which loses the colour, you can make but very middling and common ultramarine with it.

4th. Trial. When you buy it ready reduced into powder in order to know whether or not it be pure, and without any mixture. It is this; put some of this powder into a goldsmith's crucible; set it on a strong fire to make it red hot, then take off the crucible. If it be enamel, you will find it melted, but if it be true pulverised *lapis*, it will remain a powder. If there be only a mixture of enamel with the pulverised *lapis* that enamel, in melting, will gather up all the *lapis* powder, and when cold, you will find it in a little cake at the bottom of the crucible. This deception is very common among colour makers.

Remarks. The three different azures, which by means of the cements abovementioned, you will get from the *lapis*, will amount altogether to fifteen ounces for each pound of *lapis*, that is to say, ten ounces of superfine ultramarine, which will sell for twelve or thirteen ducats an ounce; three ounces of medium which will sell for between three or four half crowns, and two ounces of the common base sort, which will sell for one half crown. This last is little regarded, and is called ashy; but it will pay you for the expence of the cement, therefore you will easily be able to judge of the clear profit you can make out of it. If you employ that sort of *lapis* which loses all its colour with the trial of the fire and vinegar, you will neither get so fine ultramarine from it, nor so much in quantity, as you can from the other. And if as will be mentioned hereafter, you attempt to refine, it, it will lose a great deal of its weight.

CXXIX. *The method of calcining and preparing the lapis lazuli, in order to grind it afterwards.*

1. Take that sort of lapis lazuli which is streaked with gold veins, and which has undergone the abovementioned trials. Break it in small bits, no larger than a filbert.

Wash them in warm water, then set them on the fire in a crucible till red hot. When thus reddened take them out one by one, and extinguish them in double distilled white wine vinegar, which shall have been previously run through a hat three or four times When thus extinguished, take them all out from the vinegar, and calcine them a-new, then extinguish them as before. Repeat this operation six or seven times that they may more easily submit to the pestle in the mortar, and not stick to it.

2. As for the lapis, which looses its colour by the fire, you must dispense with the calcining of it, for as it would lose it more, and more you would at last lose both your trouble and your money.

3. Therefore put either that which is calcined, or that which is not, in a bronze mortar covered over, and pound it well. Sift it through the silk sive, covered also with its lid, that the most subtile part of the powder should not evaporate, as it is the best.

CXXX. *Directions for making the liquor fit to grind the lapis with, in order to make the ultramarine.*

1. Take three half pints of rain water, after having run through a hat three or four times. Put into a new pipkin, and dilute as much raw honey in it as will render the water yellow ; boil it till it ceases to give any scum, which take care to throw away as fast as it rises. When it is quite clear and fine, take it off the fire, bottle it for the following use.

2 Have fine dragon's blood, grind it on a porphyry stone with the above prepared honey-water ; put this when well grinded, into another bottle. Over it pour so much honey water, till it acquires a purple colour Decant it, when settled, from the ground, and keep it by itself. Such is the sort of water which is to be used to grind the *lapislazuli* with.

3 *Observation* Should the *lapis lazuli* from which you intend to draw your ultramarine, shew some purple colour of a remarkable hue and beauty, you must encourage it by means of the above mentioned honey water, which manage as follows. As the degree of purple you are to aim at, ought not to be deep but rather pale and drawing towards the flesh more than the red, if the colour which comes from the *lapis* should be too deep, you must diminish that of the honey-water, and if that of the stone is too pale, then render that of the liquor deeper By these means you may make these three sorts of colours of what degree you like, by giving more or less of the liquor, and colouring this at you will according as you see either of these proceedings requisite for your purpose.

Note. Chuse dragon's blood in tears, such as the goldsmiths use, not that which is in powder.

CXXXI. *The method of grinding the* lapis lazuli *on porphyry, and the signs which attend it.*

1. When the *lapis* is well pounded into powder, and that powder has been sifted as before directed, set it on porphyry stone, and grind with the mullar, bathing it as you grind it, with the honey water, by little and little at a time. Keep your powder on the stone, in as small a compass as you can.

To grind thus, one pound of pulverised *lapis* you must divide it into three parcels, grind one of each, and no more at a time, and it must take two hours grinding at least, to make money of it. Take care to keep your stone wet with the above prepared honey water all about your paste, that this should not stick to the stone while you grind it. This wetting must take in all one tumbler full of the liquor for the whole pound of lapis powder. When you have ground one part of that pound, take it out, and grind the second on the same spot on the stone, the next, and so on, as long as you have any to grind; be sure in grinding it, you use no other water than honey water.

2. To know weather or not it be sufficiently grinded, take a little on the tip of your finger, and mash it between your fore teeth. If you do not feel it crack, as the dry powder does, then it is sufficiently grinded. Do not grind it too much, lest it should lose its colour, which happens sometimes.

3. To dry the *lapis* after it is grinded, put it on a clean stone, and set it to dry in the shade, not in the sun, for it would spoil it. When it looks as if it were dry, touch it with the finger, and if it rubs into powder as mould or dirt would do, you may leave it longer. But if it resist finger, and do not break it is time to take it off.

4 Then comes the washing of that ultramarine azure, which is performed as follows. Take a china bowl, without any crack or rivetting whatever, and of the most perfect polish or glaze in the inside, put therein you dried lump of paste. Over it pour the soft lye above described, and let it surpass the lump in the bowl by four fingers breadth. Then wash it well between your hands, and dilute all entirely into that lye. When this is done, let it settle, and when the azure is entirely precipitated at the bottom, and the lye swims quite clear over it, decant it out gently, by inclination, and set the azure a drying in the shade, without moving it from the bowl. When you find it pretty dry, take it out carefully, spread it on the porphyry stone to finish drying. And when it is thoroughly dry, in that manner, give it the cement as follows.

CXXXII. *The method of incorporating the ground* lapis lazuli, *with either of the strong or soft cements.*

1 For one pound of the *lapis lazuli*, prepared as directed in the preceding article, take one of the strong cements discribed. Rub this over with your hands as you take it out of the water, in which preserve it; then cut in small bits, and put it a melting over warm ashes, in a glazed new pipkin. Take care that, in melting, it should not fry. When this happens, put a little lintseed oil, it will immediately cease to fry.

2. When the cement is well dissolved, take that same spatula which before served you to make it with, rub it over with a little of the same oil, and stir well the melted cement with it Then with the other hand, taking a pound of prepared *lapis lazuli*, let it run slowly into your cement, till the whole pound is put into the cement, which you must not cease to stir and mix with the spatula, as long as you pour in the lapis. Continue to stir after that, till you are well convinced that the lapis and the cement are well mixed and amalgamated together.

3. When this is done, take the pot, and pour the contents, quite boiling, into a vessel full of cold water, and with the spatula take out all that is about the sides of it, and clean it well. Then when the said cement shall be cold enough to admit touching it with your hands, rub them all over with purified lintseed oil, and take it out of the water. If in pulling it, you see it is well tinged and coloured, it is a good omen. Work it well then between your hands, and with your fingers, for near two hours, pulling it the same time to the length and breadth, to see whether there are not some bubbles inclosing little parcels of powder not well divided and incorporated, and that you may spread them in the cement in working. The more the paste is thus wrought, the better it will be afterwards, as it will require less washing to get the azure out of it.

4. When it is thus wrought, form it into a lump like a loaf of bread, and put it into a china bowl, with fresh cold water, where let it soak for ten or fifteen days longer, because the longer it soaks, the finer and more perfect it becomes, and the more easy to get the azure out. But if it be not soaked at least twelve days, it will not do at all.

CXXXIII. *Directions for extracting the azure out of the cement.*

1. Take the lump of cement just mentioned out of the cold water in which you left it to soak. Rub it softly over with your hands, and place it in a finely glazed china bowl, previously wet with the aforesaid lintseed oil.

2. Pour over it lukewarm common water, filtered through what before warming. Observe that this water, when poured on the cement, be rather cool than warm, and and let there be about two fingers breadth in the bowl above the cement. Then let it soak about one quarter of an hour.

3. Have two sticks made of box, or other fine hard wood, susceptible of a fine polish. These sticks must be made round by a turner, of a foot long or thereabouts, a little thicker than one's thumb, being larger at one of the ends, and flattened in form of an almond.

4. With these sticks, move and turn gently at first, your cement in lukewarm water. And if in so doing it should stick to the bottom of the bowl, rub your hands with oil, and detach it carefully, turning and returning it gently with your hands in the water, till at last it begins to be tinged with azure.—The first signs by which you know that the cement begins to render the ultramarine, are certain lines and streaks which appear in the water, not unlike the rays of the sun. And when this is the case, take notice, that the water soon assumes a high hue of that colour, particularly at the the first discharge of the cement, as it is always the best azure which comes first.

5. As soon therefore as you see your water sufficiently tinged, pour it through a sieve into the vessel with three cocks, described before, supporting the cement on two sticks, for fear it should stick to the bottom of the bowl, when thus left dry on it. The reason you are advised to run this water through a sieve, is to prevent any bits of cement which have broken from the lump, and be loose in the water, from running with it, so that you might stop and rejoin it to the other.

6. When you have got this first water out of the cement, pour some more water, of the same degree of warmth, rather under lukewarm than above, and proceed as before with sticks, moving and turning the cement, and so working it as to get new azure from it, which decant into a vessel separately from the first water.

7. Repeat again the same process, to draw the third azure, and decant again this into a vessel by itself.

Observe not to hurry, particularly at first, the softening of the cement in the water, by working too hastily, if you force the azure too precipitately out of the cement, you will manifestly spoil all.

CXXXIV. *Observations on the colours of the azures, at their coming out of the cement, and the signs which attend them.*

1. The most manifest sign of the first azure coming out,

is its apparant coarseness; a character which is owing to the veins of gold which appeared in the original stone, and which give the first ultramarine that sort of look.

2. The second azure will seem much finer, but its colour will not be so high nor so fine.

3. The third will increase again in appearance of fineness, but diminish still more in hue, which will be of a much paler blue than any of the two others. These observations are always on the supposition that the original stone was a good one, and had gone fairly through all the trials.

CXXXV. *The washing and purifying of the azures after they are got out of the cement.*

When the different azures are all got out of the cement, let them settle and fall down, each at the bottom of their vessels. When their waters appear quite clear and free from them on the top, pour them out gently and carefully by inclination; then supply them with soft lye, and wash those azures in it with your hands, and each of them distinctly in separate vessels by themselves. Then let them settle to the bottom, and decant out that lye, and repeat again and again the same process, till you are sure they are all well purged from the grease of the cement in which they were. Rinse them afterwards in three or four different clear waters, filtered through a hat, and they will be perfectly purified and clean.

CXXXVI. *Another way of purifying the same azures with yolks of eggs.*

1. Take half a dozen of yolks of eggs, from hens fed upon corn, and not suffered to run among the grass. Pierce the pellicula which covers those yolks with the point of a needle, and pour equally those yolks on the azure powder, as you would do oil on a sallad.

2. Do the same on all your different azures, put separately in different dishes. Then incorporate well the azure and the yolks of eggs together with your hands. When done, wash it afterwards with the softest lye, so many times that it shall at last come out as clear as you first put it in; then rinse it three or four times in clear water, which has been filtered several times through a hat.

This method of washing the azures is an excellent one. It may be deemed a true secret to give them a fine lustre and brilliancy. Never forget to let each of your waters be well settled before you change them, otherwise you will lose a great deal of the azures.

CXXXVII. *Another secret for purifying azures.*

To give the most admirable lustre to azures. Take a bullock's gall, and pour it on your separate azures, after they have been washed and purifyed in waters, lyes, and yolks of eggs. Then rub and handle well those azures with your hands, each by themselves, and one after another distinctly, for fear of mixing some of the one with any of the others. Then wash them as above directed.

CXXXVIII. *How to run the azures, after having been thus cleansed, washed and purified.*

1. The ultramarine azure, as well as all the others, ought to be run, for fear there should remain some grease, dirt, or bit of cement among them. Therefore, when they come to the last water, run them through a fine sieve, then through another more open, and through another again more so still Each time let the water settle, till you have them quite clear, or take them out by means of a sponge, as before directed, but do it with such care as not to have your azure get into the sponge with the water, which would be very detrimental to your interest

2 When you have well cleared all the waters away, let those azures all dry in their own dishes or bowls, and in the shade, not in the sun, and guard well against dust and dirt in working them.

3. When the azures are perfectly dry, gather them each separately, and put them in small white bags, made of animals skins, with the smoothest side inwards. When the little bag is tied, rub it all manner of ways, to refine the azure in it; and the more you shall have done so, the finer colour the azure will acquire when you open it, and it comes to the air again.

CXXXIX. *The method of making the green azure.*

1. With the Armenian stone, if we are to believe *Alexander Trollian*, who says, that it is enough to reduce that stone into powder on the marble or prophyry, then wash it several times in clean water, and dry it afterwards.—But it must certainly be far preferable to separate the colour from the constituent, matter of the stone, and all its earthly particles, which must undoubtedly render it much finer and fitter for painting, as it is more purified of its heterogenous parts. Therefore, the following process is most adviseable.

2 Reduce the stone into a subtile powder, then put it into brandy or distilled vinegar. Put this to digest on the

hot ashes, bath, *or balneo mariæ*, till the liquor is perfectly charged with the colour of the stone. Decant it then gently into another vessel, and pour some more brandy or vinegar on its ground, if you have reason to think that there remains some colour still in the stone, throw away all the ground, as perfectly useless, and then evaporate, on warm ashes, the vinegar or brandy impregnated with the colour; or rather distill it, as by that means you will get your liquor pure again, and may use it another time for the same purpose, instead of washing it away.

3. By this process, which seems most rational, you will get the green colour quite pure at the bottom of the vessel. Wash and clean it pure with water, and after dying, keep it for use. This is a very fine colour in painting, and has this advantage, that it never looses its brightness.

CXL. *A very fine method for marbling paper.*

The paper must first be prepared, by wetting the paper with a sponge dipped in roch-alum water, then letting it dry.—When the sheets have been thus prepared, have a pan full of water, and with a large and long handled painting-brush, take of one colour, and shake it in the water; take of another and do the same, and so on till you have taken of all the colours you intend to have on your paper. Each of these colours fall to the bottom of the water; but take with a similar brush as the first, a mixture of bullock's gall, and of dissolution of soap in water, then shake on the water, and all over the surface, and you will soon see all the colours rising up again and swimming on the top of the water each separately as you first put them. Then lay the sheet of paper on it, give it a turn on one side or the other, as you like, and take it up again; wash and set it to dry, then burnish it, and it is done.

CXLI. *Another Method.*

There are several kinds of marble paper, which vary only in the form or figure of colouring; some are dotted, others drawe in irregular lines; but the method of tinging them, simply consists in dipping the paper in a thick solution of gum tragacanth, over which the colours are uniformly spread, after having been ground with ox-gall and spirit of wine.

Process. First immerse the paper in clean water; the sheets being regularly folded over each other, and covered with a weight. It is now to be carefully laid on the colouring solution, and pressed softly down with the hand that it may bear equally on the whole, next the paper must be suspended, in order to dry; and as soon as the moisture is evaporated, the paper is polished by rubbing

it with a little soap, and smoothing it with glass highly burnished, or with a polished agate.

The colours usually employed are, for red carmine, lake, or vermillion; for, yellow, Dutch-pink and yellow ochre; for blue, Prussian blue and verditure; for green, verdigrease, a mixture of Dutch-pink, and Prussian blue, in various proportions; for orange, the orange lake, or a composition of vermilion or red-lead with Dutch-pink; and for purple, rose pink and Prussian blue. These colours are first to be finely triturated with spirit of wine, when a small proportion of gall is to be added, and the grinding of the whole to be repeated. The proper quantity of gall can be ascertained by comparative trials, because there must be only such a proportion of it used, as will suffer the spots of the various tinging matter to unite, when sprinkled on the solution of tragacanth, without intermixing or running into each other. The whole being thus prepared, the solution is to be poured into different vessels, according to the colours employed, which are to be sprinkled on the surface, and the process of marbling is completed by laying the paper on the mixture, in the manner above directed.

CXLII. *How to prepare a transparent paper to chalk with.*

In order to render themselves sooner and more easily masters of chalking neatly, and not to go out of the fine turns and out lines of a drawing beginners should first know how to prepare a transparent paper which as it lets them see the minutest parts of the strokes as through a glass, gives them of course an opportunity of acquiring by practice, a correctness, precision, and truth, in the expression of all the turns of a piece of drawing, be it whatever it may. This preparation is as follows.

1 Have one or several sheets of fine and very thin paper, and rub them over with oil, or spirit of turpentine mixed in double the quantity of oil of nuts. To cause the paper to imbibe that mixture, steep a sponge or feather in it, which pass on both sides of the paper, and then let it dry.

2 When you want to use it lay it on a print. Then with a brush, a pencil, or a pen, pass over all the stroke lines and turns of the design laid under. You may even thus learn to shade with neatness, if your colour that same design while fixed on the original print, with India ink.

Thus practising often, and for a certain while, you may learn to draw very neatly, and even with boldness, provided you apply with attention. This method will certainly prove agreeable, useful, and entertaining, for those who have not the patience to learn by the common method, which seems too tedious to some, and generally disgust beginners.

CHAP. VII.

SECRETS RELATIVE TO THE ART OF GILDING.

I. *The method of gilding with size, or oil.*

THE gold leaves which are commonly used in gilding are of different sizes, as well as of various degrees of thickness.

To gild on iron and other metals, the strongest and the purest are preferable. That which is not so pure is commonly employed by carvers in wood, as it comes cheaper to them.

We are indebted to this discovery of the secret in painting in oil, for the means of gilding in such a manner as to resist the injuries of the weather.—An art the ancients were not acquainted, with and they could not obtain from their method of applying gold, since they used nothing else but whites of eggs for gilding marble, and such other bodies as do not admit of being committed to the fire As for the wood, they made a composition which was used with size. But neither size nor whites of eggs can resist the water. Therefore they could not, with propriety, gild any other works than such as were sheltered from the intemperance of the weather, *viz* their arches, their ceilings, which were all gilt in that manner. The composition they used for gilding on wood was made of a slimy earth, which held the place of the sized white we use now-a-days, and with which guilders made that first coat, called by artists *assiette*, or burnish-gold size.

II. *To gild with size, or what is called in burnish gold.*

1. Begin by preparing your size as follows. Take about a pound of odd bits of parchment, or leather, such as is prepared for gloves or breeches. Put this a boiling in a pailful of water, till it is reduced to one half, and your size is done as it ought to be.

2. When you want to use it for wood which is to be gilt, it must be boiling hot, otherwise it would not penetrate sufficiently into the wood. If you find it too strong, you may weaken it by adding water to it. Then with a brush lay the size in smooth, if it be a plain work; but if a carved one, you must lay it in stumping with the brush; either of which ways is equally termed to *size*.

3. When the wood is thus prepared with size only, make another preparation, called *an infusion of white*, in the following manner: Take a quantity of size boiling hot, as much as you think will be sufficient for your work. Dilute a discretionable quantity of pulverised whitening in it, and let it infuse some time. When it seems well dissolved, strain it through a cloth to make it finer; than with a brush, as above, give seven or eight different coats of it in stumping on your work, and two more coats in smoothening, if it be on a carved work; but if on a plain one, you must give a dozen of coats at least; for the white is the nourishment of gold, and serves to preserve it a great while. Be careful not to give coat upon coat unless the last be very dry; otherwise the work might scale. You must even have a great care that each coat should be laid on as perfectly equal as possisble, both in the strength of the size, and thickness of the white, to avoid the same inconveniency.

4 When you have given the requisite number of coats, whether in stumping, or in smoothening, you must let the work dry thoroughly before you polish it. As soon therefore as it is perfectly dry, you must have a coarse rough cloth, quite new, and as closely wove as possible, with little deal sticks, cut square, angular, or pecked, according as the nature and carving of the work require; and thrusting one of thes sticks into the cloth, rub and smoothen the white. Then taking a brush made of boar's bristles, which has been already used, because it is softer, dip it into some clean water and wet the work in proportion as you go on in polishing with your little stick wrapped up in cloth. This precaution completes the smoothening of the work by levelling the small bumps and imprecptible undulations you may have made either in giving the white, or in polishing it. For the smoother the work, the more easy to burnish the gold, after having been applied. Wet and brush it in proportion as you polish it, with a brush a little worn, spare not to purge your brush of all the filth it gathers about the point of its hair, by washing and squeezing it again as soon as you see them grow thick in the least with that dirt.

5. When the white is once more dried, rub it with shavegrass, or rushes, in order to level still better all the grains and inequalities which may be on it. Do not, however, rub it too much with the shavegrass, because you may thereby fall from one error into another, and make your white what is called greasy or smeary, which would prevent it afterwards from uniting with the burnish gold size, which is to precede the laying on of the gold.

6. Now as it is difficult that after ten or a dozen of coats

of white, the carving should not be choaked up they who are fond of finishing their work highly, take an iron instrument, made on purpose, curved by one end, (called by the French a *fer-a-retirer*,) with this raffling crook they go over all the turns, and open all the places which want, it, to restore them to their former sharpness. Or else, take what is called a *fermoir*, or *gouge*, and give to the ornaments the same form which the carver observed when he first cut them, turning agreeably the sides of leaves according to nature; then bretelling with another instrument, called the *veining crook* (in French *fermoir à nezrond*), all the ornaments, you thereby render neater, and more delicate than the carver had first made it. That you may cut the white more neat, observe only to wet it a little with a brush.

7 When works are not of great consequence, you may easily save yourself all that trouble; principally if the carving is pretty neatly finished, by giving two or three coats only of white very clear. But the white is the principal support of gold, this operation is never so perfect as when it has received ten or twelve coats of white, and been afterwards re-cut, carved, veined, and repaired over again, as I said before.

8. Then dilute some yellow ochre, and grind it with sized water, weaker by half than that which you used for the whitening. And having made it alittle fluid and warm, lay one coat of it over all the work, principally in such deep places of the carving as you cannot come at to lay the gold leaf, that this colour may supply its want.

9. When the yellow is dry, lay over it (in all the raised places, but not in the bottom grounds) three different coats of another sort of composition, called in French *assiette*, and here, *burnished gold size*, prepared in the following manner: Bol armenian, about the bigness of a nut, and grind it by itself; blood stone, or red chalk, the bulk of a horse bean, and black lead pulverised as big as a pea, grinded both together; and at last one drop or two of tallow, which grind afterwards with all the other drugs and water, taking them a little at a time to grind and incorporate them the better. Put this composition in a cup, and pour over it some of your aforementioned size, boiling hot, and strained through a cloth. Stir and mix all well while you pour that size, that the whole may be well diluted. The brush you lay it on with ought to be soft, and the first coat lay pretty thin; but as for the two others, they must be so thick that the stuff should run with difficulty from the brush. Each coat must be well dried before giving the next. And when the last is perfectly dry, take a stiffer brush, and dry rub the work all over to smoothen all the grains and little risings of the gold size, and thereby facilitate the burnishing.

10. The gilding is performed as follows. Have first a pipkin very clean, in which put some very clean and filtered water, and a few wetting pencils, which ought to be made in the form of those ermine tales which hang in the ermine skins.—Get next a cushion, which is to be made with a light and flat square board covered with calf leather, fixed all around with nails, and stuffed underneath with cotton. Let this cushion be also surrounded by the back part, and two thirds of each of the two sides, with a band of parchment of five or six inches high, to prevent the air from blowing off the gold leaf.

11 Put what quantity of gold leaves you think proper. With the gilding knife spread these leaves very smooth, in doing of which you will assist yourself very much if you breathe over them while you pass the knife under. Then cut it in as many parts and sizes as you want, or, if there be occasion for it whole, take it with your tip, and lay it. A tip (in French, *palette*) is an instrument made with the point of a squirrel's tail placed upon a round stick flattened, and about half an inch wide by one end, with a slit, to separate and spread the better the squrrel's tail. This tip pass a long your cheek, and with it take of the gold leaf, or what part of it you have divided, and thus lay it on the work Previously, however, to this, you must have passed on the place one of your pencils immediately before the laying of the gold, otherwise the gold would be incessantly slitting and cracking. As soon as the gold leaf is laid on the work take your water pencil quite wet, and passing it above the work, let the water run from it under the leaf just applied ; this will quickly make it spread and catch. But if it should pass over the gold leaf, it would immediately spot and spoil it ; and as it is impossible to lay on gold, especially when wet, you would not be able to repair it unless you take the gold leaf entirely off, and put another in the stead. On the contrary, by the water slipping under the gold leaf just laid, you will find that this spreads infinitely more easy, and almost of itself ; it sticks faster on the gold size, never scratches, is more easily dusted for burnishing, or matting with size ; in short, the work looks infinitely better in every respect. As it is impossible with all possible care but there may happen some little accident now and then, principally in carved works, you must in such case, cut some small bits of gold, which, with a pencil, take and put on the defective places, when you look your work over.

12. When the work is perfectly dry, burnish it where you think proper, in order to detach certain parts from the other, to make them set off and shew to better advantage. To that effect use an instrument called a *burnisher*, made either of a real wolf's tooth, or rather

as they now use it, an agatte, made in the same form, and finely polished, or else a pebble called *blood stone*. Before burnishing you must, with the crooked point of your burnisher, push down all the parts of gold in the hollow parts which you forgot to do with the pencil, then dust it with a large one. When the work is burnished where you want it to be so, matt and repass, with a very soft pencil and burnish gold size, what has not been burnished, or, you may again put some vermilion, to raise the gold, and make it look brighter; which is called, in term of art, *repassing*.

13. There is again another repassing you must not forget, which is to lay, in all the hollow places of a carved work, a coat of a composition of a vermillion, as I am going to prescribe, and which will give an incomparable fire to the gold, and make it look as goldsmith's work. This composition is such—Grind together, on marble, some vermilion, gamboge, and red brown, which mix with a little Venetian turpentine, and oil of turpentine. If after having burnished, matted, and repassed your work, you find again some defective places, you may mend them with gold in shell, which is diluted with a little arabic, and applied with a pencil. This sort of faulting is no small addition to the beauty and richness of the work; the French call it *buckling with gold in shell*.

III. *To gild without gold.*

Put in a crucible one ounce of ammoniac salt, and half that quantity of common mercury. Cover and lute well the crucible for fear the mercury, should exhale. Give this a small fire for the space of half an hour. Increase th fire afterwards till the crucible is quite red hot. Then throw the composition into a pan of cold water. As soon as this matter is cold, it will be as hard as a stone. Break and grind it, and dissolve it in gum water. Wherever you lay a coat of this, it will look like gilt.

IV. *Another to the same purpose*

To gild frames, and other common things, pulverise and incorporate well together the yolk of an egg with two ounces of mercury, and one of ammoniac salt. Put this into a matrass, stop it well, and set it, for four and twenty days, in hot horse dung.

V. *A gilt without gold.*

Grind some purpurine with water; then put it to soak, with chamber lye in a pan; stir and skim it. When it has done throwing any scum, decant the chamber lye, and supply it by gum water. Whatever you write or draw

with this composition, will look as gold itself; and it admits even of being burnished with the burnisher.

VI. *The preparation of the gum-water.*

In half a pint of common water, put two ounces of gum arabic, bruised in small bits. When dissolved, it makes the right degree of gum water to be used for the above purpose.

VII. *To write in gold or silver.*

Draw the juice of juniper leaves. In this juice throw some gold or silver filings, which set there to infuse for three days; then make the trial.

VIII. *To gild on glasses, earthen, or china wares*

Take a glass, or china cup, wet it, and lay your gold where and how you like, then let it dry. Dissolve some borax in water, and of this liquor lay a coat on your gold, Set it in the fire till your glass powder in melting makes a varnish on the gilded parts, which will then appear very beautiful

IX. *To write, or paint, in gold colour.*

Pulverize some purpurine into subtle powder; then water it over gently, and by little at a time, with chamber-lye, turning incessantly, while you pour, with a stick. Let it settle, and wash it in common water so many times till you see the water comes out at last quite clear. Each time you change the water, take particular care to allow a sufficient time for the settling. Then mix, after the last water is poured away, some powder of saffron and gum water with your ground, and either write or paint, which you like. This secret is by no means an indifferent one; and you will find it very agreeable if you try.

X. *To write or paint in silver, especially with a pencil.*

Pound well, in a bell-metal mortar, some tin glass; then grind, and dilute, it on porphyry, with common water. Let it settle, and throw off the water, which will be black and dirty. Reiterate this lotion so many times, till the water remains clear. Then dilute it in gum water, and either write or paint with it. It will appear very handsome, and no ways inferior to the finest virgin silver.

XI. *To whiten and silver copper medals.*

1. Take filings from Cornwall pewter, and make a bed of

them at the bottom of a pipkin. On this bed lay one of your medals, taking care, however, they should not touch each other. Make another bed of filings over these medals, and one of medals again on these filings. Continue this alternate stratification of medals and filings, till you have laid all the medals you wanted to whiten.

2. When this is done, fill up your pan with water, and put on it a powder composed of roch alum and tartar from Montpellier, well grinded and mixed together. Boil the whole till the whitening of the medals is complete.

N. B They must have previously been cleaned with soft sand, or strong lye, to purge them from any grease.

XII. *To write in gold letters on pots, or boxes.*

Dissolve isinglass in water. When reduced into a size or glue, dilute some red tartar with it after having made it into a very subtile powder. With this mixture and a pen, or a pencil, write on your pots or boxes; then put a thick gold leaf on it, of the same sort as metal gilders use. And, when this is dry, burnish as usual.

XIII. *To gild silver in water gilding, without the assistance of mercury.*

1. Take first the finest gold, forge it weakish, then cut it in bits and neal it, on an iron plate, or in a crucible.

2. Have next a glass matrass, put your gold in, and to every drachm of gold, put half a pound of ammoniac salt, and two ounces of good *aquafortis*. Cover the matrass with a sheet of paper, turned conically by one of its corners upon one of the long sides, so as to form a funnel with the smallest, and not quite close, but terminated in a small orifice, to give a free passage to the fumes of the *aquafortis*. Set this matrass on a very slow fire, that the gold may have time to dissolve gently and gradually, and shake often the matrass, to help the dissolution. Be very careful not to make the fire too strong; for the gold would infallibly sublime, and waste itself all into vapours.

3 When the gold is entirely dissolved, pour this liquor into a glass, or china bowl; wet some old coarse linen rags on them, which set to drain on small sticks on another bowl, doing the same with what drains from them till you have used all your liquor; thendry them before agentle fire.

4. When dry, lay them on a marble stone, and set them on fire. And as soon as they are consumed grind them into a fine powder, which put afterwards into a crucible

on a lite fire. When this powder is lighted like sparkles of fire, put it on the marble again, and stir it with an iron rod till you see no more fire. Grind it then again as before, as much as you possibly can, and it is fit for gilding any sort of silver work you please.

XIV. *The* sauce *to be used for colouring silver plates, gilt with the above described powder.*

1. Grind well together, into a subtile powder, sulphur and pearl ashes, of each one ounce, and two of common salt.

2. Then, when you want to colour your gilt plates, have a quart of water, and half a pint of chamber lye, in which mix a large spoonful of the above powder. Set this to boil in a red copper pot, very clean. When the sauce boils, hold the plate with a silver wire, and then plunge it in; there leave it for about a minuet, or two at most; then take it out again by the same wire without touching it with your hands, and plunge it in the same manner in cold clean water. Should it then not look high coloured to your satisfaction, put it again in as before, till you find it sufficiently coloured.

3. The next step is to give the piece thus coloured to the burnisher, with a strict charge not to use any vinegar in his burnish. This receipt is a very good and particular secret.

XV. *A water which gilds copper and bronze. A secret very useful for watch and pin-makers.*

Dissolve equal parts of green vitriol and ammoniac salt in good double distilled vinegar; then vaporate the vinegar, and put it in the retort to distil. If in the product of the distillation you steep your metal after being polished and made hot, it will come out perfectly well gilt.

XVI. *Another.*

Take burnt copper and ammoniac salt, equal parts; *alumen plemeum*, four ounces; common salt depreciated, as much. Dissolve the whole in double distilled vinegar, then vaporate this vinegar. Distil from the rest an aqua-fortis, in which if you extinguish five or six times, brass, copper, iron, or silver, made hot, these metals will assume the colour of gold.

XVII. *To gild steel or iron, after being well polished.*

Take seven ounces of orpine; *terra merita*, one and a half; succotrine aloes, four and a half; gamboge, three and a

a half. Put all into powder, and put it in a retort, with so much of pickle water as will cover these powders by two fingers. Stir well, and mix all together, let it infuse four and twenty hours and distil. With the liquor which comes from the distillation, keep by for use, rub the steel, iron, or copper, and set it to dry in the shade.

XVIII. *To silver copper figures.*

1. Cleanse well first the figures with a strong lye, made with either pearl or brill ashes, or common salt, or alum, no matter which. Wipe them well when done, and rub them with a composition of tartar and ammoniac salt, mixed (by means of *aquafortis*) with a little dissolution of silver.

2. Now with a piece of leather, wetted in your spittle, take of these powders, and rub the copper figures till they are sufficiently silvered.

XIX. *To silver or gild pewter.*

1. Take one of the finest and most delicate goldsmith's wire brushes, rub your pewter with it so as to mark it with the strokes of the brush. When done, lay a double gold or silver leaf on that place of the pewter; then put over it a piece of skin or leather, and over that skin some putty. With a burnisher rub, for a good while, on that putty; then with a piece of pewter on the naked gold, without either skin or putty.

2. Have a care that the pewter be very clean, and that your breath should not go over it. Therefore, to do that operation, you must put your handkerchief before your mouth, and manage it so in tying it, that there should be a passage preserved on each side of your face, which should drive your breath along your cheeks, round your head, and quite up behind your ears.

XX *A composition to lay on lead, tin or any other metal, in order to hold fast the ready gilt leaves of pewter which are applied on it: useful for gilding on high steeples, domes, &c.*

1. Melt together, on a slow fire, black pitch, two pounds; oil of turpentine, four ounces; and a little rosin. When the whole is dissolved and mixed well into a kind of varnish, lay a coat of it on your work.

2. Upon steeples, the common method of gilding cannot, on account of the wind, be practised; have only the exact measures and dimensions of the place intended to be

gilt, then at home, and at leisure, cut to them some fine leaves of pewter, and gild them as usual. When done, you have no more to do but to carry up these pewter leaves, rolled in a basket, and having burnished the place on which they are to be applied with the above composition, lay the gilt pewter leaves on it, and they will stand fast enough.

XXI. *To clean and whiten silver.*

1. Rasp four ounces of dry white soap in a dish. Pour a pint of warm water on it. In another dish put a penny-worth of wine lye dried in cakes, and the same quantity of the same water. In a third dish put also another penny-worth of pearl-ashes, with another similar quantity of the same water.

2. Then, with a hair brush steeped first in the wine lye, then in the pearl-ash, and lastly in the soap liquors, rub your silver plate, and wash it afterwards with warm water, and wipe it with a dry cloth kept on a horse before the fire for that purpose.

XXII. *The preparation of gold in shell.*

Take ammoniac salt, and gold leaves, equal quantities. Bruise this in a mortar for two or three hours; and towards the end add a discretionable quantity of honey.

XXIII. *To bronze in gold colour.*

Rub the figure first with *aquafortis*, in order to cleanse and ungrease it well. Then grind on porphyry, into a subtile powder, and mix with lintseed oil, equal quantities of *terra merita* and gold litharge. With this composition paint the figure over.

XXIV *How to matt burnished gold.*

Grind together blood-stone and vermilion with the white of an egg. Then with a pencil lay it in the bottom grounds.

XXV. *How to the same to burnish silver.*

Grind ceruse white with plain water first, then with a very weak isinglass water, and make the same use of this as of the other.

XXVI. *The method of applying gold, or silver, in shell, on the wood.*

Black wood, or that which is dyed so, is the fittest to admit of this operation. The method of applying it is this.

1. Take a little gum adragant, which dilute in a good deal of water, to make it weak. With this weak gum water dilute your gold or silver, and with a pencil lay it on such places of your work as receive and shew the light, without touching on those which are the shades. To express these, touch the parts with indigo diluted in a very weak gum arabic water.

2. When this is done, lay one coat of drying varnish, made of oil of spike and sandarac. If the varnish be too thick, thin it with a little oil; and in mixing it, take care not to boil it so hard but you may bear some on your hand without scalding the place.

N. B. Have attention to make your gum waters for this sort of work always very weak; otherwise they would tarnish and spoil all the gold or silver.

XXVII. *To gild sandy gold.*

Take any colour, and grind it either with oil, or with gum Lay a few coats of it on your work, according as you think there may be need of it. When dry, lay one coat of size, and while it is still fresh, sift some brass filings on it; let it dry so, and varnish it afterwards.

XXVIII. *Varnish to be laid on gilding and silvering.*

Grind verdigrease, on marble, with common water, in which you have infused saffron for eight hours.

XXIX. *The method of bronzing.*

Take three pennyworth of spal, one of litharge, a gill of lintseed oil, and boil the whole to the consistence of an unguent. Before you apply it, dilute the quantity you intend to make use of with turpentine oil, and lay a coat of vermillion on the work before bronzing.

XXX *A water to gild iron with.*

1. Put in a glass, bottle, with a pint of river water, one ounce of white copperas, and as much of white alum; two drachms of verd grease, and the same quantity of common salt. Boil all together to the reduction of one half. Then

stop the bottle well, for fear the contents should lose the strength.

2. To gild the iron with it, make it red hot in the fire, and plunge it in this liquor.

XXXI. *To make the fine writing gold.*

1. Take gold in shell, and sulphur, in the proportion of ten drachms of this, well grinded on porphyry and amalgamated, to every sequin-worth of the other. Put this mixture into a proportionable leather bag, in which work it continually for the space of two days, then pour all into a crucible, and burn it on a slow fire. This done, wash what remains with filtered lime water, and by filtration also, get your water out again from the composition. If after this operation, you do not find it high enough yet in hue, wash it again and again in the same manner, till it looks fine

2. To apply it, dilute some bol armenian with isinglass, and write what you please, and let it dry; then apply your gold, and when dry burnish it.

XXXII. *How to get the gold or silver out of gilt plates.*

1. Mix together one ounce of *aquafortis*, and one of spring water, with half an ounce of common, and one drachm of ammoniac salts. Put all on the fire, and boil it; then put in the plate to soak from which you want to get the gold or silver out. A little while after, take your plate out, and scrape it over the liquor.

2. The gold will remain suspended in this regal water; and to make a separation of them, pour in it double the the quantity of common water; or again, throw a halfpenny in it, and boil it, and all the gold will fix itself to it.

XXXIII. *To gild paper on the edge.*

1. Beat the white of an egg in three times its quantity of common water, and beat it till it is all come into a froth Let it settle into water again, and lay a coat of it on the edge of your paper.

2. Next lay another of bol armenian and ammoniac salt, grinded with soap suds. Then put the gold, and let it dry before burnishing it.

XXXIV. *To gild on vellum.*

Mix some saffron in powder with garlic juice. Put two

or three coats of this on the vellum, and let it dry a little, but not quite. Then breathing on the coat apply the gold leaf with cotton; and when dry, burnish it.

XXXV. *Another way.*

Lay first a coat of lime and burnt ivory, grinded together with a weak isinglass water. Apply the gold on it, and when dry burnish it.

XXXVI. *Another way.*

Grind and mix together four ounces of bol armenian, one of aloes, and two of starch; dilute it in water, and lay a coat of it on the vellum, then the gold immediately. When all is dry, burnish it.

XXXVII. *A gilt without gold.*

Take the juice from saffron flowers, in the season, or dry saffron in powder, with an equal quantity of yellow orpine well purified from its earthy particles. Grind all well together, and put it a digesting in hot horse dung for the space of three weeks. At the end of that term you may use it to gild whatever you like.

XXXVIII. *To gild without gold.*

Open a hen's egg by one end, and get all out from the inside. Refill it again with chalidonia,s juice and mercury then stop it well with mastich, and put it under a hen which just begins to set. When the time of hatching is come, the composition will be done, and fit for gilding.

XXXIX. *To gild on calf and sheep skin.*

Wet the leather with whites of eggs. When dry, rub it with your hand, and a little olive oil; then put the gold leaf, and apply the hot iron on it. Whatever the hot iron shall not have touched, will go off by brushing.

XL. *Gold and silver in shell.*

1. Take salt-petre, gum arabic, and gold leaves, wash them all together in common water. The gold will sink to the bottom, whence pouring the water off you may then put in the shell.

2. The silver is worked in the same manner, except the saltpetre, instead of which you put white salt.

XLI. *To gild marble.*

Grind the finest bol armenian you can find with lintseed or nut oil Of this you lay a coat on the marble, as a kind of gold size. When this is neither too fresh nor too dry, apply the gold ; and when thoroughly dry burnish it.

XLII. *To apply gold on glazed wares, christal, glass, china, &c.*

Take a pennyworth of lintseed oil, and as much of gold litharge; a half pennyworth of umber, and as much of cerus-e. Grind all togeth-r on marble, and with a little hair pencil, dipped into the said colour, draw whatever you will on the abovementioned wares. As soon as dry, lay your gold on it with cotton, which pass along your cheek before taking the gold with it. And as soon as this is perfectly dry, burnish it.

XLIII. *Matt gold in oil.*

Take yellow ochre, a little umber white and black lead, which grind all together with greasy oil, and use it when necessary.

XLIV. *To dye any metal, or stone, gold colour, without gold.*

Grind together in a subtile powder ammoniac salt, white vitriol, saltpetre and verdigrease. Cover the metal, or stone, you want to dye, all over with this powder Set it thus covered on the fire, and let it be there a full hour ; then taking it out, plunge it in chamber lye.

XLIV. *To whiten copper.*

Take one ounce of zinc, one drachm and a third part of it of sublimed mercury. Grind all into a powder then rub with it what you want to whiten.

XLVI. *To whiten silver without the assistance of fire.*

Take *Mons martirum's* talo, which calcine well in an oven till it can be pulverised. Sift it very fine. Then dipping a piece of cloth or stuff in it, rub the silver with it.

XLVII. *To whiten iron like silver.*

Mix ammoniac salt powder, and quick lime, in cold water. Then make your iron red hot several times, and each time plunge it in that solution. It will turn as white as silver.

CHAP. VIII.

THE ART OF DYING, WOODS, BONES, &c.

I. *The composition for red.*

1. CHOP Brasil wood very fine, and boil it in common water, till it has acquired an agreeable colour, then strain it through a cloth.

2. Give your wood first a coat of yellow, made of saffron, diluted in water. Then the wood, being thus previously tinged with a pale yellow, and dried, give afterwards several coats of the Brasil wood water, till the hue pleases you

3. When the last coat is dry, burnish it with the burnisher, and lay another coat of drying varnish with the palm of your hand, and you will have a red oranged very agreeable.

4. If you want a deeper red, or rather a darker, boil the Brasil wood in water impregnated with a dissolution of alum, or quick-lime.

II. *Another red.*

Soak the chopped Brasil wood in oil of tartar; and with it rub your wood, proceeding for the rest as above directed.

III. *Another way.*

Pound orchanetta into powder, mix it with oil of nut, make it luke warm, and rub your wood with it. The rest as above.

IV. *To dye wood of a purplish colour.*

Soak Dutch turnsol in water; add a tincture of Brasil wood made in lime water, and you will obtain a purple, with which you may dye your wood, and then burnish and varnish as usual.

V. *A blue purple.*

Take that sort of German turnsol which painters use with size. Dissolve it in water and strain it through a linen cloth. Give a coat of this dye to the wood; and if the hue be too strong, give it another of a paler dye, by adding clear water to a part of the other. When dry, burnish it as usual.

VI. *Another.*

Four ounces of Brasil, and half a pound of India woods, boiled together in two quarts of water, with one ounce of common alum.

VII. *A blue for wood.*

Slack lime in water, and decant it out of the ground. In three pints of this water dissolve four ounces of turnsol, and boil it one hour. Then give several coats of it to your wood.

VIII. *A green.*

Grind Spanish verdigrease into a subtile powder with strong vinegar. Add and mix well with this, two ounces of green vitriol. Boil all of it a quarter of an hour in two quarts of water, and put your wood soaking till the colour be to your liking. For the rest proceed as above.

IX. *A yellow.*

Dissolve turnsol in two quarts of water. Then grind some indigo on marble with that water, and set it in a vessel on the fire with weak size to dilute it. When done give a coat of this dye to your wood with a brush, and when dry, polish it with the burnisher.

X. *Another yellow.*

Boil in water some grinded *terra merita*, and soak your wood in it afterwards.

XI. *Another finer yellow.*

Four ounces of French berries, boiled for about a quarter of an hour in a quart of water, with about the bulk of a filbert of roch-alum. Then soak the wood in it.

XII. *To dye wood of a fine polished white.*

Take the finest English white chalk, and grind it in subtile powder on marble, then let it dry, and set it in a pipkin on the fire with a weak sized water, having great care not to let it turn brown. When it is tolerably hot, give first a coat of size to your wood, and let it dry; then give one or two coats of the aforesaid white over it. These being dry also, polish with the rushes and burnish with the burnisher.

XIII. *To dye in polished black.*

Grind lamp black on marble with gum water. Put it next in a pipkin, and give a coat of this, with a brush to your wood; then polish it when dry.

XIV. *Another way.*

Soak bits of rusty iron in the best black ink. A few days after rub your wood with it, and when you see it well penetrated and dry, polish it with the burnisher.

XV. *To imitate ebony.*

Infuse gall nuts in vinegar, wherein you have soaked rusty nails; then rub your wood with this, let it dry, polish and burnish.

XVI. *Another way.*

Chuse a good hard wood, and not veiny, such as pear, apple or hawthorn trees, and blacken them. When black, rub them with a bit of cloth; then with a reed brush made on purpose, dipped in melted wax, mixed in a pot with common black, rub your wood till it shines like ebony.

XVII. *Another way.*

Holly is a very fit sort of wood to take the dye of ebony Form it first into the shape you intend to give it, then put it in a hatter's copper to boil, leave it till it has acquired a perfect degree of blackness. Then take off the filth of the dye, and polish it as you would ebony, with rushes, &c.

XVIII. *A fine black easily made.*

Take good ink, put it in a stone pan, new and well neal-

ed, then set it in the sun to exficcate it into a cake. When dry, take and scrape it out from the pan with a knife, and grind it into an impalpable powder on marble. This powder diluted with varnish, will produce a fine black.

XIX. *To dye wood silver fashion.*

Pound tin glass, in a mortar, and reduce it into powder. Add water to it by degrees, till it come into a liquid like liquor for, painting. Put it in a clean pipkin, with size, and set it on the fire to warm. Brush your wood with this liquor, and when it is dry, burnish it.

XX. *To dye in gold, silver, or copper.*

Pound very fine, in a mortar, some roch-crystal with clear water, set it to warm in a new pipkin, with a little size, and give a coat of it on your wood with a brush. When dry, rub a piece of gold, silver, or copper, on the wood thus prepared, and it will assume the colour of such of these metals as you rub it with. After this is done, burnish it as usual.

XXI. *To give nut, or pear tree, what undulation you like*

Slack some quick lime in chamber-lye. Then with a brush dipped in it form your undulation on the wood according to your fancy. And when dry rub it well with a rind of pork.

XXII. *To imitate the root of nut tree.*

Give seven or eight coats of size to your wood, till it remains shiny. Then before your size is quite dry, strike here and there a confused quantity of spots with bistre grinded with common water. When dry varnish it with the Chinese varnish.

XXIII. *To give a fine colour to the cherry-tree wood.*

Take one ounce of orchanetta; cut it in two or three bits, and put it to soak for forty-eight hours in three ounces of good oil of olive. Then with this oil anoint your cherry tree wood after it is worked and shaped as you intend it; it will give a fine lustre.

XXIV. *To marble wood.*

1. Give it a coat of black, diluted in varnish. Repeat it one, two, three or as many times as you think proper; then polish it as usual.

2. Dilute some white varnish made with white gum, or shell lac, and white sandarac. Lay this white on the black ground, tracing with it what oddities you like When dry, give a light rub with rushes, then wipe it, and give a last coat of fine transparent white varnish, in order to preserve the brightness. Let this dry at leisure, then polish it.

XXV. *To imitate white marble.*

Break and calcine the finest white marble you can find; grind it as fine as you can, and dilute it with size. Lay two coats of this on your wood, which, when dry, polish and varnish as before directed.

XXVI. *To imitate black marble.*

Burn some lamp black in a shovel, red hot, then grind it with brandy. For the bigness of an egg of black, put the size of a pea of lead in drops, as much of tallow, and the same quantity of soap. Grind and mix these together, then dilute it with a very weak size water. Give four coats of this, and when dry, polish as usual.

XXVII. *A counterfaction of coral.*

1. Reduce goat's horns into a subtile powder. Put it in a clear lye made of lime and pearl ashes. Let it there rest for a fortnight. When reduced into a palp, add cinnabar in powder, or dragon's blood in tears, pulverised very fine, in what quantity you think necessary to give the quantity of matter you have got a fine and perfect corol hue.

2. Next boil this composition till it comes very thick, then take it off from the fire and mould it in moulds shaped in forms of coral. Or else cast it again in what other sorts of moulds you like, to make figures of it, and other sorts of work, which will produce a fine effect.

Observation. This secret was worth immense sums of money to him who found it out. The Turks paid them magnificently. But this branch of trade was soon put to an end by the cheats which were practised with the merchants of Tunis and Algiers.

XXVIII. *To take the impression of any seal.*

1. Take half a pound of mercury; the same quantity of chrystalline vitriol; as much verdigrease. Pulverise well these two last ingredients, and put them along with the first in a new iron pan, with smith's forge water. Stir all well with a wooden spatula, till the mercury is perfectly incorporated with the powders. Then wash that paste with cold water and change it till it remains quite clear as when you put it in. Put the lump in the air, it will harden.

2. When you want to take the impression of a seal with it, place it over the fire on an iron plate. When there appears on it some drops like pearls, then it is hot enough; take it off and knead it in your hands with your fingers, it will becomes pliable like wax; smoothen one side of it, and apply it on the seal, pressing it to make it take the impression. When done, lift it up, and set it in the air, where it will come again as hard as metal, and will serve you to seal the same letter as the original seal, without probability of discovering it, should even the real one be laid on it.

XXIX. *Another way.*

Heat some mercury in a crucible, and silver filings in another, in the proportion of two parts of mercury to one of silver. As soon as the mercury begins to move, pour it on the silver filings. Let this cool, and then put it in a glass mortar. Pound it well with a pestle of the same, and add a little water in which you have dissolved some verdigrease. Stir this for three days, five or six times a day. Decant out the verdigrease water, and replace it with good vinegar, with which pound it again in the same mortar, as before, a couple of hours, changing vinegar as soon as it blackens. Pound it again two hours, with chamber lye instead of vinegar, changing it the same, during that time, as you did the vinegar. Then take that matter, lay it on a wash-leather skin, which bring up all round it, and tie it above with a string. Press the lump well in that skin, so as to separate and squeeze out all the superfluous mercury which passes through the leather. When none comes out, open the skin, take the lump in your hand, and knead it, and smoothen one side of it to take the impression you like, proceeding for the rest, as above directed. It hardens in the air, and softens with the heat of the hand as you would do a piece of wax.

XXX. *To get birds with wite feathers.*

Make a mixture of *semper vivum majus's* juice, and

olive oil, and rub with it the eggs on which the hen is setting. All the birds which shall come from those eggs will be white feathered.

XXXI. *To soften ivory.*

In three ounces of spirit of nitre, and fifteen of white wine, or even mere spring water, mixed together, put your ivory a soaking. And in three or four days, it will be so soft as to obey under the fingers.

XXXII. *To dye ivory thus softened.*

1. Dissolve, in spirit of wine, such colour you want to dye your ivory with. And when the spirit of wine shall be sufficiently tinged with the colour you have put in, plunge your ivory in it, and leave it there till it is sufficiently penetrated with it, and dyed inwardly. Then give that ivory what form you will.

2. To harden it afterwards, wrap it in a sheet of white paper, and cover it with decrepitated common salt, and the driest you can make it; in which situation leave it twenty-four hours.

XXXIII. *Another way to soften ivory.*

Cut a large root of *mandrake* into small bits, and infuse first, then boil it in water. Put your ivory in this boiling liquor, and boil it too, till as soft as wax.

XXXIV. *To whiten ivory, which has been spoiled.*

Take roch-alum, dissolve it in water, in a sufficient quantity, to render the water all milky. Boil this liquor, and soak your ivory in it for one hour, then rub it with a hair brush. When done, wrap it in a wet piece of linen to dry it leisurely and gradually, otherwise it would certainly split.

XXXV. *To whiten green ivory: and whiten again that which has turned of a brown yellow.*

1. Slack some lime in water, put your ivory in that water, after decanted from the ground, and boil it till it looks white.

2. To polish, set it on the turner's wheel, and after having worked it, take rushes and pumice stone subtile powder with water, rub it till it looks perfectly smooth. Next to that, heat it, by turning it against a piece of linen, or

sheepskin leather, and when hot, rub it over with a little whitening diluted in oil of olive, continuing turning as before; then with a little dry whitening, and a piece of soft white rag. When this is performed the ivory will look as white as snow.

XXXVI. *To petrify wood, &c.*

Take equal quantities of gem salt, roch-alum, white vinegar calx, and pebbles powder. Mix all these ingredients together, and there will happen an ebullition. If, after it is over, throw in this liquor, any porous matter, and leave it there soaking for three, four, or five days, they will positively turn into petrifactions.

XXXVII. *To imitate tortoise shell with horn.*

Take one ounce of gold litharge, and half an ounce of quick lime. Grind all together, and mix it to the consistence of pap, with a sufficient quantity of chamber-lye. Put of this on the horn, and three or four hours afterwards it will be perfectly marked.

XXXIII. *A preparation for the tortoise shell.*

Make a mixture as above, of quick-lime, orpine, pearl ashes, and *aquafortis*. Mixed well together, and put your horn or tortoise shell soaking in it.

XXXIX. *To dye bones and mould them in all manner of shapes.*

1. Boil together twelve pounds of quick-lime, and one of calcined roch-alum, in water to the reduction of one third. Add two more pounds of quick-lime, and boil it again till it can carry an egg without its sinking to the bottom. Let it cool, then filter it.

2. Take twelve pounds of that liquor; half a pound of rasped Brasil wood, and four ounces of scarlet flocks; boil all about five minutes on a slow fire, then decant the clearest part of it, and put it by. Put on the *fæces* of Brasil wood and scarlet about four pounds of the first water, boil it the same time as the other, and decant the clearest part of it on the other. Repeat this operation, till the new added water draws no more colour from the *fæces*.

3. Now rasp any quantity of bones, and boil them in clear lime water. Then take them out, put them in a matrass, and

over them pour some of the tinged water, so as to soak them. Place the matrass on a mild sand bath and evaporate the liquor. Add some more liquor and evaporate it again, continuing to add and evaporate the tinged liquor, till the rasped bones are all turned into a soft paste.

4. Take this paste, and mould it as you like, in tin or other moulds, to make whatever thing or figure you want. Set it in the mould for a day or two, till it acquire the shape you wish it; to harden it boil it in a water of alum and salt petre first afterwards, in oil of nut. These figures look incontestibly to be made of bones, without conceiving how they can be made such, out of that matter, and in one solid piece.

XL. *To dye bones in black.*

Take six ounces of litharge, and the same quantity of quick lime. Boil all in common water, along with the bones. Keep stirring till the water begins to boil. Then take it out, and never cease stirring till the water is cold again; by that time the bones will be dyed black.

XLI. *To soften bones.*

Take equal parts of Roman vitriol, and common salt. Distil the spirits out by the root. If in the water you get from the distillation, you put the bones a-soaking, they will become as soft as wax.

XLII. *To dye bones in green.*

Pound well together in a quart of strong vinegar, three ounces of verdigrease, as much of brass filings, and a handful of rue When done, put all in a glass vessel along with the bones you want to dye, and stop it well Carry this into a cold cellar, leave it for a fortnight, the bones will be dyed green.

XLIII. *A salt for hardening soft bones.*

Take equal quantities of ammoniac, common decrepitated and gem salts, as well as of *plumeum saccarinum*, roch and shell alums. Pulverise and mix altogether, then put it in a glass vessel well stopped, which bury in hot horse dung, that the matter should melt into water. Congeal it on warm ashes. Then [illegible] *lequium* again by means of the horse dung, as before. When thus liquified for the second time, it is fit for use. Keep it to harden and consolidate any thing, smear it over with it.

XLIV. *To make figures, or vases, with egg shells.*

Put egg shells in a crucible, and place it in a potter's furnace for two days, that they may there be perfectly calcined, then grind them dry into a subtile powder.

2 Next, with gum-arabic water and whites of eggs, beaten together, make a liquor, with which knead that powder, and make a paste or dough of it.

3. With that dough, to which give the consistence of potter's clay, make and form whatever figure or vase you like, and set them in the sun to dry.

XLV. *To dye bones and ivory of a fine red.*

1. Boil scarlet flocks in clear water assisted with pearl ashes to draw the colour the better; then clarify it with roch alum, and strain this tincture through a piece of linen.

2. To dye afterwards any bones or ivory in red you must rub them first with *aquafortis*, and then immediately with this tincture.

XLVI. *To make a past in imitation of black marble.*

Dissolve two ounces of spalt on a gentle fire, in a glazed pipkin. When in perfect fusion, add a third part of harable, ready melted, stir altogether. When both are well mixed and united, take the pipkin off the fire, and throw the contents, boiling hot, into a mould of a fine polish in the inside. When cold and dry, take the piece from off the mould, and you will find that nothing can imitate so well black marble as this deceptive composition.

XLVII. *To dye marble, or alabaster, blue or purple.*

1. Pound together in a marble mortar, parsnips and purple lillies, with a sufficient quantity of white wine vinegar. Proportion the quantity of parsnips and lillies, to each, other, according to the hue you wish to give the liquor. If you cannot get one of these two juices, make use of that you can get; and to every pound of liquor mixed and prepared, put an ounce of alum.

2. In this dye put your marble or alabaster, and boil them, supposing they are not too considerable to go into the vessel with the liquor. And if they be, you must heat one part of it as much as you possibly can, then dye it with the liquor boiling hot, as thus proceed from place to place, till you have dyed it all over.

XLVIII. *To soften amber, otherwise Karabe.*

Melt fine white and pure wax in a glass vessel. When melted, put your amber in it, and leave it there till you find it soft to your satisfaction. Then take it out and give it what form you like. To harden it again put it in a dry place in the shade.

XLIX. *To whiten ivory which has been spoiled.*

Take a little black soap, and lay it on the ivory. Present it to the fire, and when it has bubbled a little while, wipe it off.

L. *To whiten bones.*

Put a handful of bran and quick lime together, in a new pipkin, with sufficient quantity of water, and boil it. In this put the bones, and boil them all till perfectly freed from greasy particles.

LI. *To dye bones in green.*

Grind well a discretionable quantity of verdigrease, which you put with vinegar in a copper vessel, and the bones in it. Cover this, and lute it so well that no air can come at the contents. Put in hot horse dung, and leave it there for a fortnight, after which time take your bones out; they will be coloured of a fine green, which will never rub off.

LII. *To bronze wooden, plaister, ivory, or other figures so that the bronze may stand water for ever.*

1. Grind English brown red, as fine as possible, with nut oil. With this paint all over the figure intended to be bronzed, and let it dry.

2. Have next some powder of Germain gold in a shell, and in another, some of the varnish described in Art. lxiii. Chap. iii. Dip a pencil in the varnish, and then in the gold, and give as smooth and equal a coat of this to your figure as you can.

3. To save expence, you may instead of the gold, take some fine bronze which is much cheaper.

LIII. *A water to dye bones and wood.*

1. Put the strongest white wine vinegar in an earthen

pan, in which, set to infuse for seven days, copper filings, Roman vitriol, roch alum, and verdigrease.

2. In this liquor put a-boiling what you want to dye, and it will take the colour perfectly.

3. If you want a red dye, instead of verdigrease put some red; if yellow, put some yellow, &c. according to the colour you may require, with a discretionable quantity of roch-alum for either.

LIV. *To dye bones and ivory an emerald green.*

Put in aquafortis as much flos ænei as it can dissolve; and in that water put a-soaking for twelve hours only, whatever you want to dye, and they will take the colour to perfection in that space of time.

LV. *To whiten alabaster and white marble.*

Infuse for twelve hours, some subtile pumice stone powder, in verjuice; then with a cloth or a sponge, wet your marble with the liquor, and it will become perfectly white.

LVI. *To dye wood vermilion colour.*

Smoothen and rub well the wood first; then give it four or five coats of vermilion, subtilely pulverised, and diluted with lime and curd cheese water. When dry, polish it over again with rushes and oil of spike; then for the last give it four or five coats of varnish, made with harabe (amber) and oil of spike and let it dry.

LVII. *To soften horn, so that you may cast it in a mould as melted lead.*

Make a strong lye with equal quantities of pearl ashes and quick lime. Rasp your horns, and put these raspings in that lye. They will soon turn into pap. Then put in this pap whatever colour you like, and cast it in whatever mould you choose.

Let these stand in the mould a day or two to acquire the shape you want, more perfectly, and to harden them, boil them in a water of alum and salt petre first and afterwards in oil of nut.

CHAP. X.

SECRETS RELATIVE TO THE MAKING OF CURIOUS AND USEFUL SORTS OF INK.

I. *A good shining ink.*

1. PUT four quarts of warm water in a glazed pipkin. Add eight ounces of turpentine oil, and one pound of gall-nuts bruised in a mortar. Let the whole infuse thus for a week, then boil it gently, till with a pen you may draw a stroke yellow and shiny with it. Strain it through a strong cloth. Set it on a blasting fire, and as soon as it boils, add seven ounces of green vitriol to it, keep stirring it with a stick till it is perfectly dissolved. Let this rest for two days, without disturbing it. There will be a skim on the top, which must be thrown off. Decant next the clearest part into another vessel, which you set on a gentle fire, to evaporate about two fingers of the liquor, then let it rest four or five days, and it will be fit for use.

2 Rain water, or that in which walnuts have been infused, are both very good for making of ink.

3. With white wine, or old beer, you may likewise make very good shining ink.

4. A carp's gall is very proper to mix among it.

II. *To write on grease, and make the ink run on it.*

1. Cut a bullock's gall open into a pan, and put a handful of salt and about a quarter of a pint of vinegar to it, which you stir and mix well. Thus you may keep the gall for twelve months, without its corrupting.

2. When you are writing, and you find your paper or parchment greasy, put a drop of that gall among your ink in the ink-horn, and you will find no more difficulty to make your pen mark.

III. *An ink-stone, with which ink-stands may be made, and with which you may write without ink.*

1. Take gum arabic, fourteen ounces; lamp black, thirteen; and burnt willow wood coals, three. Pound the gum into an impalpable powder, and dissolve it into a pint of common water. This done, knead your above-mentioned powders with part of this gum water, so as to make a

paste or dough of them, as it were for bread. With this dough form ink-stands, of the shape and form you like best, and in these ink-stands, while the composition is still soft, you may stamp a few small holes.

2 This done, dry these stands in an ardent furnace for four hours, or in the shade, a sufficient time. When dry, brush them over with your aforementioned gum-water, till they appear as black and shiny as jet, and as hard as marble.

3, When you want to use them, put a few drops of water in one of the holes, and put a pen to soak in it at the same time. If the water be but just put in, the ink will not be quite so black; but if it have remained a little while, it will be as black as the blackest of any inks.

IV. *To write with common clear water.*

Take gall nut powder, and vitriol calcined in the sun to whiteness, of each four ounces and sandarak, one and a half. All being pulverised and mixed, rub your paper with that powder; then steeping your pen in any common water, and writing with it, it will appear black like any other ink.

V. *A good ink both for drawing and writing.*

1 Bruise with a hammer one pound of gall-nuts, and put it to infuse for a fortnight in the sun, in two quarts of clear water, stirring it now and then. Strain this infusion through a sieve or cloth in a glazed pipkin.

2. In another vessel put two ounces of gum-arabic, and half of the above infusion In the other half which remains to dissolve two ounces and a half of German green vitriol, and let it infuse for four-and twenty hours. Join afterwards both infusions together; and a week afterwards, or thereabouts, the ink will be very good, and fit for use.

VI. *To make very good ink without gall-nuts, which will be equally good to wash drawings and plans, and strike very neat lines with the pen.*

1. In half a pound of honey put one yolk of an egg, and beat it a good while with a flat stick. Then asperse the matter over with three drachms of gum arabic in subtile powder. Let this stay about three days, during which beat it often with a stick of walnut-tree wood.

2 Next to this, put to it such a quantity of lampblack as will make it in consistence of a dough, which you make in cakes, and dry it in the air, to render it portable.

3. When you want to use, it dilute it with water, or with a lye made either of vine-wood ashes, or walnut-tree, or oak, or even peach stones.

VII. *An invisible ink.*

1. Dissolve one ounce of ammoniac salt in a glass tumbler of water, and write. When you wish to make the writing appear, hold the paper to the fire, and it will become black.
2. The same may be done with the juice of an onion.

VIII. *Another way.*

Dissolve some alum, and write with the liquor. Steep the paper in water, and the writing will appear white.

IX. *To make good India ink.*

Burn some lamp-black in a crucible till the fume which arises in doing it, has entirely subsided; grind it next on porphry, or marble, with a pretty strong water of gum-tragacanth. Add an equal quantity of indigo burnt, and grinded in the same manner. Then mix them both together on the stone, and grind them for two hours. Gather up the composition, in a flat square, of the height and thickness you are willing to give to your sticks. Cut these with a knife to your intended size, and put them, if you chuse into an iron mould; and lest the paste should stick to them, rub the inside of the mould with lamp or ivory black, or with peach stones dust, which you burn in a crucible stifled with a brick to stop it well.

X. *Red Ink.*

Dissolve half an ounce of gum-arabic in three ounces of rose water. Then with this water, dilute cinnabar, vermilion, or mimium.

Ink of any colour may be made in the same manner, by substituting only a proper colouring ingredient to the aforementioned cinnabar, &c.

XI. *A green ink.*

Grind together verdigrease saffron, rue juice, then dilute this paste in the above-mentioned gum rose water.

XII. *To make an ink which appears and disappears alternately.*

Write with an infusion of gall-nuts filtered through brown paper, and the writing will not be visible. When you want to make it appear, steep a little sponge, or bit of cotton, into an infusion of vitriol, and pass it over the written place of the paper; the writing will immediately appear. To rub it off, and make the paper look all white again, do the same with the spirit of vitriol, and all the writing will be gone. To make it visible again rub the paper over with oil of tartar; and thus continue for ever.

XIII. *The invisible method of conveying secrets.*

1st. Ink.

Infuse for twenty-four hours, half an ounce of gold litharge in half a pint of distilled white wine vinegar, and shake the bottle often during the first twelve hours of the infusion. When all is well settled, decant the clear part into another phial, which you must stop carefully, and throw the fæces away.

If you have any secret to communicate to a friend, write it with this liquor, and it will be no more vissible than if you wrote it with clear pump water.

XIV. *An ink to write over the other.*

2d. Ink.

Over the secret, written with the first invisible ink, you write any indifferent matter with the following composition.

Burn some corks in the fire: and when they are so thoroughly burnt as to blaze no more, put them into a bason, and soak them with brandy; then grind them into a paste, which when you want to use, you dilute with distilled water, till it is fit to write with like any other ink.

XV. *Another ink which effaces the second, and makes the first appear.*

3d. Ink.

Dilute rose water and sorrel juice separately. Put half a pint of each together in a bottle, with two ounces of quick lime, and one of auripigment. Stir this well, now and then, and let it infuse during twenty-four hours, as you did the first. Decant the clear part, and throw the grounds away.

When you want to find out what was written with the first invisible ink, and which lies concealed under the se-

cond black one,steep a sponge into this present liquor,and passing quickly over, every line ; what was written in black vanishes at one stroke and what was invisible appears in its stead as black, and as much effaceable as if written with common ink.

XVI. *An ink which will go off in six days.*

Write with willow-wood cinders, pulverised and diluted with common water.

XVII. *Another which you may rub off when you please.*

Dilute gun-powder in common water, and write with it on a piece of parchment ; then when you want to efface it, take your handkerchief and rub it off.

XVIII. *Powder ink.*

Take equal parts of black rosin, burnt peach, or apricot stones, vitriol and gall nuts, and two of gum-arabic. Put the whole in powder, or in a cake, as you like best.

XIX. *An exceeding good writing ink.*

1. Boil half a pound of India wood shavings in two quarts of good vinegar, to the reduction of one half. Take off the shavings, and substitute four ounces of gall nuts bruised, and put all into a strong bottle, which you expose in the sun for three or four days, shaking it during that time three or four times a day. Then add a dissolution of two ounces and a half of gum-arabic in half a pint of either water or vinegar Let the whole stand again in the sun for a week, shaking it several times every day, during that term ; strain that liquor afterwards, and keep it for use.

2. If you should want to render this ink shiny, you must dissolve both the vitriol and gum arabic in an infusion of India wood, made as before directed, with the addition of one handful of pomegranate rinds in the bottle wherein the gall nut is.

3. If instead of setting this composition in the sun, you should boil it, it will take but a quarter of an hour a-doing But it is never so good, and besides, always turns muddy.

XX. *A gold colour ink, without gold.*

Put half a drachm of saffron one of aur pigment, and one she-goat's, or five or six jack galls in a glass bottle ; and set for a fortnight in hot horse dung At the end of that term, add a gill of gum water ; and place it again for the same length of time in horse dung. Then it is fit for use.

XXI. *Another way.*

Pulverise into an impalpable powder one ounce of orpine, and as much crystal. Put this powder in five or six whites of eggs beaten, then turned into water. Mix all well, and it will be fit either to write or to paint in gold colour.

XXII. *To write in silver without silver.*

Mix so well one ounce of the finest pewter and two of quicksilver together, that both become quite fluid. Then grind it on porphyry with gum-water, and write with it. All the writing will look then as if done with silver.

XXIII. *A good shining ink.*

Infuse for a day in quart of good table beer half a pound of the blackest and most shiny gall nuts you can find. Add three ounces of gum-arabic, and half an ounce of brown sugar candy, with four ounces of green copperas. Then boil the whole in a glazed pipkin for about an hour, strain it through a cloth, and put it in the celler to keep for use.

XXIV. *A blue ink.*

Dilute half a pound of indigo with some flake white and sugar, in a sufficient quantity of gum-water.
The same may be done with ultramarine, and gum-water.

XXV. *A yellow ink.*

Dilute in gum-water some saffron, or French berries, or gamboge, and you will have a yellow ink. The same may be done with any other colouring ingredient, to obtain an ink of the colour one likes to have.

XXVI. *A green ink which may keep two years.*

Put a pint of water on the fire in a varnished pipkin; and when it is ready to boil, throw in two ounces of verdigrease pounded, and boil it gently on a slow fire for the space of half an hour, stirring it often during that time with a wooden spatula. Then add one ounce of white tartar, well pulverised, and boil it one quarter of an hour. Strain two or three times through a cloth, then set it before the fire to evaporate part of it, in order to make it more shiny. But observe, that the more it boils, the more it loses of its green colour, and approaches to the blue.

XXVII. *A shining ink.*

Put in a clean brass cauldron six quarts of white wine, or beer, or rain water, with one pound of gall-nuts, and two ounces of roch-alum in powder, which you boil all together, to the reduction of one half. Take this liquor off from the fire, and strain it through a cloth into a glazed pipkin, and set it on the fire again for two hours longer. Then for the three or four following days, observe to stir it well only with a little stick, without boiling it at all; it will be fit for use. Whenever you use it, it will be very pale, but in twenty-four hours after, it will be as black as jet.

XXVIII. *A way of writing which will not be visible, unless you hold the paper to the sun, or the light of a candle.*

Take flake white, or any other whitening, and dilute it in a water impregnated with gum adragant. If you write with this liquor, the writing will not be perceivable, unless you apply the paper to the sun, or the light of a candle. The reason why it is so, is, that the rays of light will not find the same facility to pass through the letters formed with this liquor, as through the other parts of the paper.

XXIX. *A secret to revive old writings, which are almost defaced.*

Boil gall-nuts into wine: then steeping a sponge into that liquor, and passing it on the lines of the old writing, all the letters which were almost undecypherable will appear as fresh as newly done.

XXX. *To write in gold or silver letters.*

Take gold or silver in shells, and dilute it with some gum-arabic water. Then dip either a pen or a pencil in it, and write.

XXXI. *An iris on white paper.*

Boil in a new iron pot any quantity of sublimate with common water, and a handful of small nails. When the mercury begins to revivify, which happens after two or three hours boiling, throw the whole in a pan of cold water, half filled, and place it uncovered for one night, in a bog-house. Then the colours will swim on the top. Observe that the pan must be perforated at the lowest part

on one side, and stop it with a cork or any other common thing ; and that a sheet of white paper must have been placed at the bottom of it, previous to the half-filling it with the cold water, in which you are directed to throw the boiling composition. After this has been left in the bog house the space of one night, and the colours do swim on the top, unstop the hole, and let the pan empty itself. Then the colours will settle, and fix themselves on the sheet of paper ; and when this begins to dry, take it quite out of the pan, to finish drying it in the shade.

XXXII. *A shining ink.*

1. In a quart of rain water settled, filtered and purified, infuse for four or five hours, on a slow fire, one pound of gall-nuts, chusing the smallest and blackest. Let them be previously bruised in a mortar, with some promegranate, rinds, and raspings of fig-tree wood. Next to this make a lye of six ounces of Roman vitriol, and boil it for the space of one hour at least, stirring it with a stick of fig-tree wood ; then let it rest twelve hours, and sift it.

2. On the same ground you may add the same quantity of water, and let it infuse three days ; then boil it, as above directed, with new copperas.

XXXIII. *A common ink.*

1. Bruise six ounces of gall-nuts, and as much gum-arabic, and nine of green vitriol. Put them afterwards in three quarts, at least, of river, spring, or rain water. Stir the composition three or four times a day. And after seven days infusion, strain all through a cloth, your ink is made.

2. This ground, as well as that above, will admit of fresh water being put to it, with an addition of vitriol also.

XXXIV. *How to prepare printers ink.*

1. Take one pound of common tupentine, made with the sandarak of the ancients, which is nothing else but juniper and lintseed oil. Add to it one ounce of rosin black, which is the smoke of it, and a sufficient quantity of oil of nuts.

2 Set this composition on the fire, and boil it to a good consistence. Such is the whole secret. Observe however, that in the summer it must boil a little more, and a little less in the winter. For in the summer the ink must be thicker, and thinner in the winter ; because the heat makes it more fluid. In which case it is therefore proper to boil it a little more, or to diminish the quantity of oil, allowed in the proportion to that of the turpentine.

CHAP. XI.

SECRETS RELATIVE TO WINE.

I. *To make a vine produce a sweet wine.*

ONE month before gathering the grapes, you must twist such branches as are loaded with them, so as to interrupt the circulation of the sap; then strip the leaves off entirely, that the sun may act with all its power on the grains, and, by dissipating their superfluous moisture, procure a sweetness to the liquor contained in them, when they come to be pressed.

II. *To make a sweet wine of a very agreeable flavour, and besides very wholesome.*

Gather the grapes, and expose them for three whole days in the sun. On the fourth day at noon, put them under the press, and receive the first drop which runs of itself before pressing. When this virgin drop shall have boiled, or fermented, put to every fifty quarts of it one ounce of Florentine orrice in subtile powder. A few days after take it out clear from its lye, and then bottle it.

III. *To clarify in two days new wine when muddy.*

Take a discretionable quantity of fine and thin beech shavings, which put into a bag, and hang by the bung-hole, in the cask. Two days after, take out the bag; and if from red you want to make it white, you may do it by putting in the cask a quart of very clear whey.

IV. *To make the wine keep* mout *or* unfermented *for twelve months.*

Take the first, or virgin wine, which runs of itself from the grapes before pressing; cask and stop it well, then smear the cask all over with tar, so that the water could not penetrate through any part of the wood into the wine. Plunge these casks into a pond deep enough to cover them entirely with water, and leave them there for forty days. After which term you may take them out and the wine contained in them will keep for twelve months.

V. *To clarify a wine which is turned.*

Take clean roch-alum in powder, half a pound; sugar of roses, as much; honey, whether skimmed or not, eight pounds, and a quart of good wine. Mix all well, and put it in a cask of wine, stirring all as you pour it in. Take the bung off till the next day, then put it on again. Two or three days after this, it will be quite clear.

VI. *To prevent wine from corrupting.*

Put to infuse in a cask a handful of gentian-root, tied in a bag.

VII. *To prevent wine from growing sour, and turning into vinegar.*

Hang by the bung-hole, in the cask, a piece of bacon, of about one pound and a half, and replace the bung. Or else throw into the wine a little bagful of ashes of virgin vine.

VIII. *To restore a wine turned.*

Draw a pailful of it; or, take the same quantity of another good sort, which boil, and throw boiling hot over that which is spoiled and stinking; then stop the cask quickly with its bung. A fortnight after taste it, and you will find it as good as ever it was, or can be.

IX. *To restore a wine* fusted, *or tasting of the cask.*

Draw that wine entirely out of its own lye, and put it in another cask over a good lye. Then through the bung-hole, hang up a bag with four ounces of laurel berries in powder, and a sufficient quantity of steel filings at the bottom of the bag to prevent its swimming on the top of the wine. And in proportion as you draw a certain quantity of liquor, let down the bag.

X. *To prevent wine from pricking.*

Put in the cask half a pound of spirit of tartar. Or else, when the wine is still new and *mout*, throw in two ounces of common alum for every hogshead.

XI. *To make wine keep.*

Extract the salt from the best vine branches; and of this put three ounces in every hogshead at Martinmass, when the casks are bunged up.

XII. *To clarify wine easily.*

Put in the cask two quarts of boiling milk, after having well skimmed it.

XIII. *To prevent wine from turning.*

Put in the cask one pound of hare's shot.

XIV. *To correct a musty taste in wine.*

Knead a dough of the best wheat flour, and make it in the form of a rolling pin, or a short thick stick. Half bake it in the oven, and stick it all over with cloves. Replace it in the oven to finish baking it quite. Suspend it in the cask over the wine without touching it, and let it remain there; or else let it plunge in the wine for a few days, and take it quite out afterwards. It will correct any bad flavour the wine might have acquired.

XV. *To correct a sour, or bitter taste in wine.*

Boil a quartern of barley in four quarts of water, to the reduction of two. Strain what remains through a cloth, and pour it in the cask, stirring all together with a stick, without touching the lye.

XVI. *To restore a spoiled wine.*

Change the wine from its own lye, upon that of good wine. Pulverise three of four nutmegs, and as many dry orange peels, and throw them in. Stop well the bung, and let it ferment one fortnight. After that term is over, you will find it better than ever. This method has gone through many experiments.

XVII. *To sweeten a tart wine.*

Put in a hogshead of such wine, a quarter of a pint of good wine vinegar, saturated with litharge; and it will soon lose its tartness.

XVIII. *To prevent tartness in wine.*

Take in the month of March, two basonfuls of river

sand, and after having dried it in the sun, or in the oven throw it in the cask.

XIX. *To heighten a wine in liquor, and give it an agreeable flavour.*

Take two dozen or thereabouts of myrtle berries, very ripe. Bruise them coarsely after having dried them and put them in a bag, which suspend in the middle of the cask then stop this well with its bung. A fortnight afterwards take off the bag, and you will have a very agreeable wine.

XX. *To give wine a most agreeable flavour.*

Take a pailful of *mout*, which boil and evaporate to the consistence of honey. Then mix with it an ounce of Florentine orrice, cut in small bits, and one drachm of *costus*. Put all into a bag, and let it down in the cask by the bung hole, after having previously drawn out a sufficient quantity of wine to prevent the bag from coming at it. This bag being thus suspended by a string which will hang out of the bung hole, stop it well and there will drop from the bag into the wine a liquor which will give it a most agreeable taste.

XXI. *How to find out whether or not there be water mixed in a cask of wine.*

Throw in the cask one wild pear or apple. If either of these fruits swim, it is a proof there is no water in the wine; for if there be any, it will sink.

XXII. *To separate water from wine.*

Put into the cask a wick of cotton, which should soak in the wine by one end, and come out of the cask at the bung-hole by the other; and every drop of water which may happen to be mixed with the wine, will still out by that wick or filter

You may again put some of this wine into a cup made of ivy wood, and then the water will perspire through the pores of the cup, and the wine remain.

XXIII. *To ungrease wine in less than twenty-four hours.*

Take common salt, gum-arabic, and vine brush ashes, of each half an ounce. Tie all in a bag, and fix it to a hazel-tree stick then by the bung-hole, stir well the wine for a quarter of an hour, after which take it out, and stop the cask. The next day the wine will be as sound as ever

XXIV. *To cure those who are too much addicted to drinking wine.*

Cut in the spring a branch of vine, in the time when the sap ascends most strongly; and receive in a cup the liquor which runs from that branch. If you mix some of this liquor with wine, and give it to a man already drunk, he will never relish wine afterwards.

XXV. *To recover a person from intoxication.*

Make such a person drink a glass of vinegar, or some cabbage juice, otherwise give him some honey. You may likewise meet with success by giving the patient a glass of wine quite warm to drink, or a dish of strong coffee, without milk or sugar, adding to it a large tea-spoonful of salt.

XXVI. *To preserve wine good to the last.*

Take a pint of the best spirit of wine, and put in it the bulk of your two fists of the second peel of the alder tree, which is green. After it has infused three days, strain the liquor through a cloth, and pour it into a hogshead of wine. That wine will keep good for ten years, if you want it.

XXVII. *To make currant wine.*

Gather your currants when full ripe, which will commonly be about the middle of July; break them well in a tub or vat, (some have a mill constructed for the purpose, consisting of a hopper fixed upon two lignum vitæ rollers.) Press out, and measure your juice, and to each gallon put two gallons of water; to one gallon of this mixture put three pounds of Muscovada sugar, or well clarified coarse sugar; stir it well till the sugar is quite dissolved, and then turn it up.

Your casks should be sweet and clean, such as have not had either beer or cider in them, and if new, let them be first well seasoned.

As wine, made in the common manner, either of grapes or currants, is long fermenting, we think that to filter it through a sand filter, would be of great benefit. All liquors that require to ferment are injured in proportion to the time that is requisite to complete the fermentation; and this time is longer or shorter, in proportion as there is more or less of those substances in the liquor that fermentation throws off.

It may not be amiss to observe, that your juice should not stand over night; after being pressed out it should be

immediately mixed, and put up in casks, before fermentation commences. The casks should not be so full as to work out at the bung, but when the fermentation is done, the casks should be filled. While fermenting, something should lightly cover the bung hole, so as to prevent flies, &c. getting in; as soon as the fermentation is over, the casks should be stopped up If your wine has been filtered, in the manner above mentioned, it will not require racking, but may stand upon the lees, until drawn off for use. Wine that stands upon the lees attains a stronger body, and is in a great measure divested of that sweet, luscious taste, peculiar to made wines; nay, if it is not wanted for present use, it may without any damage stand two years on the lees. When the wine is drawn off, the lees, by distillation, afford a fine spirit; some put this spirit into the wine again, the practise is not, however, recommended.

When you make currant wine, do not be prevailed upon to add more than one third juice, as above prescribed, in hopes the wine may be richer, for that would render it infallibly hard and unpleasant; nor yet a greater proportion of sugar, as it would certainly deprive itof its pure vinous taste.

By this management you may have wine, letting it have a proper age, equal to Madeira, at least superior to most wines commonly imported, and for much less money.

To make thirty gallons of wine, the proportion of each ingredient, is, eight gallons of juice, sixteen of water, and seventy-two pounds of sugar, equal to six gallons, making in all thirty gallons.

N B. An extraordinary good spirit for medicinal and other uses, may be distilled from currant juice, by adding one quart of molasses to a gallon of juice, to give it a proper fermentation.

XXVIII. *To make excellent wine of apple cider.*

Take of ripe and mellow fruit, the last of September, or in October, grind them fine, and let the pummice stand over one night before pressing it out, if it can without danger of fermenting. When your cider is made, boil two barrels of it down to one; then strain it through clean sand placed in a vessel made like a lye tub After it is strained put it in a clean cask, set it in a cool cellar, and after two years it will be fit for use. If kept for three or four years, it is equal to Rhenish, or Malaga wines. Much, however, depends upon the quality of your cider.

XXIX. *Another Method.*

Take of cider (made and clarified as directed in Art. j.

Chap. xix.) one barrel; add thereto of honey, sufficient to make it bear an egg. Stir the honey well into it, and put it into a clean cask to stand and ferment While fermenting fill the cask up each day, that the filth may work out at the bung-hole. When the fermentation has subsided, put the bung loosely in, lest you burst the cask. At the end of five or six weeks, draw the liquor off into a clean tub, take the white of eight eggs, and if the liquor be not perfectly clear, put to them a pint of clean sand, beat the eggs and sand well together, and put them into the liquor. Then add a gallon of cider spirit, and after the whole is well mixed and stirred together, and your cask well cleaned, return it into the cask, bung it up tight, and place it in a proper situation for racking off in the following April.

Wine has been made by following the preceding directions, equal or superior to most foreign wines, and at less than a fifth of the cost.

XXX. *Maple wine.*

Boil four, five, or six gallons of sap (according to its strength) into one, and add yeast according to the quantity you make. After it is fermented, set it aside in a cool place, well stopped. If kept for two or three years it will become a pleasant sound wine.

CHAP. XII.

CONCERNING THE COMPOSITION OF VINEGARS.

I. *To make good wine vinegar in a short time.*

THROW some *Taxus*, wood, or yew-tree, in any wine, and it will not be long before it turns into vinegar.

II. *To change wine into strong vinegar.*

Take tartar, ginger, and long pepper, of each equal doses. Infuse all for one week, in good strong vinegar, then take it out and let it dry. When you want to make vinegar, put a bag full of these drugs in wine, it will soon turn into vinegar.

III. *To make very good and strong vinegar with the worst of wines.*

Grind into subtile powder five pounds of crude tartar.

Pour on it one pound of oil of vitriol. Wrap up the whole in a bag, tie it and hang it by the bung-hole, in a cask of bad and totally spoiled wine. Move and stir now and then that bag in the wine, and it will turn into very good vinegar.

IV. *To turn wine into vinegar in less than three hours.*

Put in the wine a red beet, and it will be quite sour and true vinegar in less than three hours.

V. *To restore such a wine to its first taste.*

Take off the red beet, and in its stead put a cabbage root into that wine, and it will return to its primary taste in the same space of time.

VI. *An excellent preparation of vinegar.*

1. Take white cinnamon, long pepper, and *cyprus*, of each an ounce; round pepper, half an ounce, and two nutmegs. Pulverise each drug separately, and put them in so many distinct bags. Put them in six different and separate quarts of the best vinegar, and boil them two or three minutes.

2. Then boil separately six quarts of good wine.

3. Season a cask, which is done by pouring a quart of the best vinegar into it, with which you rinse it. Then pour in your boiled wine and vinegars, and fill half way the cask with the worst and most spoiled wine. Stop the cask, and keep it till the vinegar is done. Then draw from it, and refil the cask with the same quantity of bad wine as you take of vinegar.

VII. *To render vinegar alkali.*

Saturate any quantity of vinegar with salt of tartar

VIII. *To make in one hour, good rose vinegar.*

Put a drachm of hare's marrow in a pint of wine, and you will see the consequence.

IX. *Another method to make such vinegar in an instant.*

1. Take common roses and unripe blackberries, which grow in hedges, of each four ounces, and of barberry fruits one. Dry them all in the shade, and reduce them into subtile powder.

2. Mix two drachms of this powder into a glass of white

or red wine. Then let it settle to the bottom, and strain it through a cloth. It will be a very fine vinegar

X. *To operate the same in one hour's time, on a larger quantity of wine.*

1. Take the best rye flour, which dilute in the strongest vinegar, and make a thin round cake with it Bake it quite dry in the oven; then pound it into a very fine powder, with which and vinegar, make again another cake as before, and bake it like the first. Reiterate this operation three or four times.

2. If you hang the last made cake in a cask of wine quite hot, you will turn the whole into vinegar in less than an hour.

XI. *The receipt of the vinegar called the* Grand Constable's Vinegar.

Take one pound of damask raisins, and cure them of their stones. Put these raisins in a glazed jar, with two quarts of good rose vinegar. Let all infuse for one night over hot ashes, then boil it the next morning four of five minutes only. Take it of the fire and let it cool, strain it through a cloth, and bottle it to keep for use, afterwards cork the bottle.

XII. *A secret to increase the strength and sharpness of the vinegar.*

Boil two quarts of good vinegar to the evaporation of one; then put it in a vessel, and set it in the sun for a week. Now if you mix this vinegar among six times as large a quantity of bad vinegar in a small cask, it will not only mend it, but make it very strong and agreeable.

XIII. *Another way to do the same.*

The root of *rubus idæus*, the leaves of wild pear-tree, acorns roasted in the fire, the liquor in which vetches (peas) have been boiled, horse chesnut powder put in a bag, &c. &c. add greatly to the sharpness of vinegar.

XIV. *The secret for making good vinegar, given by a vinegar-man at* Paris.

1. Pound coarsely, or rather bruise only, one ounce of long pepper, as much ginger, and the same quantity of *pyrethra*. Put these in a pan over the fire with six quarts of wine. Heat this only to whiteness, then put it in a small cask and set it in the sun, or over a baker's oven or any other warm place.

2 Now and then add new wine in your cask, after having previously heated it as before, and let that quantity be no

more than two or three quarts at a time, till the cask is quite full.—If you add a few quarts of real vinegar, it will be the stronger. Before casking the wine, let it rest in the pan in which it has boiled for two or three days. A glazed earthen pan is preferable to a copper one for boiling the wine in; for during the three days infusion, the copper might communicate a dangerous quality of verdigrease to the vinegar. When you put vinegar to meliorate this composition, instead of wine, you must take care to heat it over the fire, but not so much as the wine. Let the cask be well rinsed and perfectly clean, before putting the vinegar in.

3. The wild blackberries which grow in hedges, are very good to make vinegar, but they must be used while red; then put them in the wine, heat this to whiteness, and proceed in the same manner as you do with *pyrethra*, ginger and long pepper. The dose of blackberries is not determined; you may take any discretionable quantity of them, and the vinegar which results from these is very good.

XV. *To make vinegar with water.*

Put thirty or forty pounds of wild pears in a large tub, where you leave them for three days to ferment, then pour some water over them, and repeat this every day for a month. At the end of which it will make a very good vinegar.

XVI. *To make good vinegar with spoiled wine.*

Put a large kettle full of spoiled wine on the fire, boil and skim it. When wasted of a third put it in a cask, wherein there is some very good vinegar. Add a few handfuls of chervile over it in the cask, and stop the vessel perfectly close. You will have very good vinegar in a very short time.

XVII. *A dry portable vinegar, or the* vinaigre en poudre.

Wash well half a pound of white tartar, with warm water then dry it, and pulverise it as fine as possible. Soak that powder with good sharp vinegar, and dry it before the fire, or in the sun. Resoak it again as before with vinegar, and dry as above, repeating this operation a dozen times. By these means you shall have a very good and sharp powder, which turns water itself instantly into vinegar. It is very convenient to carry in the pocket, especially when travelling.

XVIII. *To make maple vinegar.*

Expose the sap to the sun in the open air, and it will in a short time become good vinegar.

CHAP. XIII.

SECRETS RELATIVE TO LIQUORS AND ESSENTIAL OILS.

I. *To make as good wine as* Spanish *wine.*

1. TAKE one hundred pounds weight of dry raisins, from which pick off the stems, and open the fruit with a knife. Put these in a large wooden tub, very clean. Boil fifteen gallons of rain water, purified by straining through the filtering paper. Pour it over the raisins, and cover it to preserve the heat of the water. Twenty-four hours after take off the raisins, which will be swelled, and pound them in a large marble mortar, then put them again in the tub. Heat fifteen gallons more of water, which pour over the other with the raisins, and throw in twenty-five pounds of coarse sugar. Stir all well and cover the tub, over with two blankets. Three days after, by a cock placed at the bottom of the tub, draw out all the liquor, and cask it, adding six quarts of brandy to it. Press the ground with an apothecary's press, and put the juice in the cask, with two pounds of white tartar pounded into a subtile powder, in order to promote the fermentation, add five or six ounces of polychrest salt, and a knot of garden cress seed, of about sixteen or eighteen ounces weight, and another knot of seven pugils of alder flowers. These knots are to be suspended by a thread in a cask.

2. If the wine look too yellow, you must strain it through a jelly bag, in which you shall put one pound of sweet almonds, pounded with milk. The older the wine, so much the better it is.

3. To make it red, dissolve some cochineal pounded in a certain quantity of brandy, along with a little alum powder, in order to draw the better the dye of the cochineal, which put to digest on a sand bath. Till the brandy has assumed a proper degree of colour, give it to your wine in a sufficient degree.

4. It is preferable to clarify the sugar well, and to put it in the cask instead of the tub.

II. *To make the* rossolis.

1. Boil first some water, and let it cool till it is no more than lukewarm. Take next all the sorts of fragrant flowers the season can afford, well picked, keeping none but the petals of each flower. Infuse these, separately, in some

of that lukewarm water, to extract their odorous smell or fragrancy. Then take them off, and drain them. Pour all these different waters in one pitcher, and to every three quarts of this mixture, put a quart or three pints of of spirit of wine, three pounds of clarified sugar, one quarter of a pint of essential oil of aniseed, and an equal quantity of essential oil of cinnamon.

2. Should your *rossolis* prove too sweet and slimy in the mouth, add half a pint, or more, of spirit of wine.

3. If you think the essential oil of aniseed should whiten too much the *rossolis*, mix it with the spirit of wine, before putting it in the mixed waters.

4. If you want to increase the fragrancy, add a few spoonfuls of essential oils of different flowers, with one pugil or two of musk, prepared amber, and lump sugar pulverized. Then strain the *rossolis* through a jelly bag to clarify it, bottle and stop it well. Thus may it keep for ten years and upwards.

III. *To make a* rossolis *which may serve as a foundation to other liquors.*

Put three quarts of brandy and one of water, in a glazed earthen pot. Place this pot on a charcoal fire, adding a crust of bread and one ounce of aniseed, and cover it till it boils. Then uncover it and let it boil five minutes, and put in a pound of sugar, or more if you chuse. Now beat the white of an egg with a little of your liquor, take the pot off the fire and throw in the white of an egg. Let this thus rest for three days.

IV. *To make* Eau de Franchipane.

Put half a pound of sugar, in a quart of water, add a quarter of a pound of jessamine flowers which infuse for some time.—When you find the liquor has acquired a sufficient degree of fragrancy, strain it through a jelly bag, and add a few drops of essential oil of ambergris.

V. *Orange flower water made instantly.*

Put one handful of orange flowers in a quart of water, with a quarter of a pound of sugar. Then beat the liquor by pouring it from one vessel to another, till the water has acquired what degree of fragrancy you wish it.

VI. *Muscadine rose water.*

Put two handfuls of muscadine roses in one quart of water with one quarter of a pound of sugar. For the rest proceed as before.

VII. *To make raspberry, strawberry, cherry, or other such waters.*

1. Take the ripest raspberries, strain them through a linen cloth to express all the juice out of them. Put this in a glass bottle uncorked, and set it in the sun, in a stove, or before the fire till cleared down. Then decant it gently into another bottle, without disturbing the *fæces* which are at the bottom.

2. To half a pint of this juice, put a quart of common water, and a quarter of a pound of sugar. Beat all together, by pouring backwards and forwards, from one vessel into another, strain it through a linen cloth, and set it to cool in a pail of ice. It is a fine cooling draught in the summer.

3. Strawberries, cherries, &c. are done in the same manner.

VIII. *Lemonade water at a cheap rate.*

Dissolve half a pound of sugar in a quart of water; rasp over it the yellow part of one, two, or three lemons, as you like, and mix a few drops of essential oil of sulphur in the liquor. Then cut three or four slices of lemon in the bowl, when you put the liquor in it.

IX. *Apricot water.*

Take a dozen of apricots, very ripe. Peel and stone them. Boil a quart of water, then take it off from the fire and throw in your apricots. Half an hour after put in a quarter of a pound of lump sugar, which being dissolved, strain all through a cloth, and put it to cool in ice as the others.

X. *To make exceeding good lemonade.*

On a quart of water put the juice of three lemons, or two only if they be very juicy. Add seven or eight zests of them besides, with one quarter of a pound of sugar. When the sugar is dissolved, strain the liquor, and cool it in ice as before mentioned.

XI. *To make orangeade the same way.*

You proceed with your oranges as with the lemons. If these be good, but little juicy, you must squeeze three or four oranges, with the addition of eight or ten zests. If you love odour, you may add some musk, and prepared amber

XII. *To make a cooling cinnamon water.*

Boil one quart of water in a glass, vessel before the fire Take it off, and put in two or three cloves, and about half an ounce of whole cinnamon. Stop well the bottle, and when the water is cold put half a pint only of it in two quarts of water with sugar to your palate, a quarter of a pound is the proper quantity. Then cool it as usual in ice, before serving.

XIII. *To make coriander water:*

Take a handful of coriander, which shell, and put in a quart of water half cooled again, after having boiled Add one quarter of a pound of sugar, and when the water has acquired a sufficient degree of taste, strain, cool, and serve it as usual.

XIV. *Aniseed water.*

The aniseed water is made in the same manner as the coriander water.

XV. *Citron water.*

Take a citron which strip of its peel, and cut in slices crossways. Put these slices in a quart of water with a quarter of a pound of sugar. Beat well this water by pouring it backwards and forwards from one vessel into another, and when it has a sufficient taste of the citron, strain it, &c.

XVI. *Cinnamon water.*

Bruise a pound of the finest cinnamon, and put to infuse for twenty-four hours in four pounds of distilled rose water, with half a pound or a pint of white wine, which put all together during that time in a glass matrass on warm ashes, and stop well the vessel, so that it breathe no air. At the end of twenty-four hours increase the fire so as to procure a distillation, by putting the matrass in the *balneum mariæ*, and keep this liquor in bottles well stopped.

XVII. *To make cedrat water.*

Have a dozen of fine lemons, which split in two parts Take out all the kernels, and keep nothing but the pulp wherein the juice is contained. Put them in a new glazed earthen pan. Boil one pound of sugar to the *plume* degree,

then pour it in the pot over the lemons. Set this on a good charcoal fire, and boil it till the sugar comes to the *pearl* degree, then bottle it.

XVIII. *Juniper water.*

Put two pounds of juniper berries with two quarts of brandy in a stone bottle, which stop well and place on hot ashes to infuse for twenty four hours. Strain the liquor, and add one pound of sugar, half an ounce of cinnamon, as much cloves, a preserved half peel of a lemon, and two pugils of aniseed. Put these in the bottle, stop it well, and place it at two or three different times in a baker's oven, after the bread is out, and when you may bear your hand in it without burning.

XIX. *To make good hydromel, otherwise metheglin.*

Take honey and water, equal quantities in weight. Boil them together and skim the honey. When done sufficiently you may know by putting an egg in, which must swim at top. Pour then the liquor in a cask where there has been spirit of wine, or good brandy, well soaked with either, and still wet with the spirit, and add two or three grains of ambergris. Stop well the cask, and set it in the sun during the dog days. When it begins to ferment, un stop the cask to let the scum out, which arises like that of new wine. During that time you must not stir the cask. When the first fire of the fermentation has subsided, stop the cask again, and the hydromel is fit for keeping.

Note. Instead of the sun, you may in other seasons, make use of the top of a baker's oven a stove or a hot-house.

XX. *A light and delicate* rossolis, *known under the denomination of* populo.

1. Boil three quarts of water, then let them cool again. Add one quart of spirit of wine, one of clarified sugar, half a glass of essential oil of cinnamon, and a very little of musk and ambergris.

2. Observe the sugar should not be boiled too much in clarifying, for fear it should crystalize when in the *rossolis* and cause clouds in it Observe also to boil the water first, as prescribed before using it, to prevent the corrupting of the liquor; which would infalliably be the case were you to employ it unboiled.

XXI. *Angelic water.*

1. Take half an ounce of angelic, as much cinnamon, &c.

quarter part of cloves, the same quantity of mace, of coriander, add of green anise-seed, with half an ounce of cedar wood. Bruise all these ingredients in a mortar, and and set them to infuse for twelve hours, with two quarts of genuine brandy, in a matrass or retort. Then distil the liquor by *balneum mariæ*.

2. Two or three ounces only of this essential spirit in two quarts of brandy, with the addition of a very small quantity of musk and ambergris, will make a very agreeable liquor.

XXII. *The cinnamon water.*

In three quarts of once boiled water, and then cooled again put half a pint of essential spirit of cinnamon, distilled like that of anise-seed. Add three pints of spirit of wine, and one of clarified sugar. Strain all through the jelly bag, &c. &c.

XXIII. *Strong anise-seed water, or animated brandy.*

Put half a pint of essential spirit of anise-seed into three quarts of the best genuine brandy, with one of boiled water. If you want it sweet, add clarified sugar. Strain all through the jelly bag, &c. &c.

XXIV. *To make white* Ratasia, *called otherwise* Eaude-Noaiu, *or kernel water.*

Pound three quarters of a pound of cherry-stones, wood and kernels, or almonds in a stone pitcher, with twelve quarts of brandy. Add one drachm of cinnamon, a dozen of cloves, two pugils of coriander, and three pounds and a half of sugar. Let all these infuse together, till sufficiently tasty, and ready to strain, add four quarts of water that has been boiled and is cool again. Then run it through the jelly-bag, and next through the filtering paper; bottle and stop it for use.

XXV. *An exceeding good* Ratasia.

On a quart of good brandy put half a pint of cherry juice, as much of currants, and the same of raspberries. Add a few cloves, a pugil of white pepper in grain, two of green coriander, and a stick or two of cinnamon. Then pound the stones of the cherries, and put them in, wood and all together. Add a few kernels of apricots, thirty or forty are sufficient. Stop well the pitcher, which must be a new one, after all these ingredients are in, let the whole infuse a couple of months in the shade, shaking twice or thrice during that space of time, at the end of

which run the liquor through the flannel bag, and next through the filtering paper, then bottle and stop it well for use.

Note. In increasing in due proportion the quantity of the brandy, and the doses of each of the ingredients prescribed, you may make what quantity you like of this *Ratasia*.

XXVI. *A smelling water.*

1. Put in any quantity of brandy, benjamin, and storax calamite, equal parts; a little cloves and mace, coarsely bruised. Set this digesting for five or six days on warm ashes. When the liquor is tinged of a fine red, decant it gently from the residue in a glass bottle, and throw in a few grains of musk, before stopping it.

2. Three drops of this smelling water in a common glass tumbler of water, give it a very agreeable fragrance.

3. With the ground, or residue, you may make lozenges, in adding a little gum-adragrant to bind them.

XXVII. *How to make a* Sherbet, *a Persian species of Punch.*

There are various ways of making Sherbet. Some make punch here with rum only, others with brandy; others with arrach, and others with shrub. Some will have it mixed with two of these spirits, and others will make it with white wine. Some put acids, others do not; and among the acids some chuse tartar only, others lemons, and others *Seville* oranges; some squeeze a little of each of these two last tart fruits together in the same bowl of punch.

It is the same with respect to sherbet, the famous *Persian* drink. They make it with the various syrups extracted from all the odoriferous flowers; and the dose is one part of such a syrup to ten parts of any spirituous liquor. Or again, they make a weak rossolis, with the zests of oranges and lemons boiled together in water with sugar. Some will make it with the essential spirit of musk and amber only, put in boiling water with sugar as we do our punch.

XXVIII. *To make* Vin des-Dieux.

Peel two large lemons and cut them in slices; do the same with two large golden pipins. Put all a soaking in a pan with a pint of good *burgundy*, three quarters of a pound of lump sugar in powder, six cloves and half a gill of orange flower water. Cover the pan, and keep it thus for five or six hours, then strain the liquor through the

flannel bag. You may musk and amber it like the *hypocras* if you will.

XXIX. *Burnt wine.*

Put a quart of good *Burgundy* in an open pan, with a pound of sugar, two leaves of mace, a little long pepper, a dozen of cloves, two or three tops of rosemary branches, and two bay leaves. Place that in the middle of wheel-fire of blasting charcoal. When the wine begins to be hot, set the fire to it with a bit of paper, and thus let it kindle and blaze till it goes out of itself. This wine is drank quite hot, and it is an admirable drink, especially when the weather is very cold.

XXX. *To imitate muscat wine.*

In a cask of new white wine (that is to say, before it has worked) introduce by the bung-hole, five or six tops of alder flowers dried up. Let these flowers hang by a string, and eight or ten days after take them out again. You will obtain a wine which will not differ from muscat.

XXXI. *A violet water.*

Infuse some violets in cold brandy. When these have lost their colour, take them out, and put in new ones. Repeat this till you are satisfied with your tincture. When you take the violets out, you must press them gently; then sweeten that brandy according to discretion; and, if you choose, you may add again a little orange-flowers for the sake of the odour.

XXXII. *To make a clear and white* hypocras.

To every one pint of claret add eight ounces of sugar, and nine, if it be white wine; half a lemon, four cloves, a little cinnamon, which should be double the quantity of cloves, three grains of pepper, four of coriander, a little bit of ginger, and eight almonds cut in bits. Let the whole be bruised and put into a pan, with the wine poured over it; stir, infuse one hour and strain through the flannel bag.

XXXIII. *To make the true* Eau-de-Noiau.

Pound one pound of apricot kernels, without reducing them into oil. Then bruise another pound of cherry-stones, wood, and kernels all together. Put all in a pitcher of five or six gallons, in which put only three and a half, or four gallons of the best brandy, and two of water; five pounds of sugar; to every one quart of liquor, add two

grains of white pepper, and eight drachms of cinnamon, both bruised. Let all infuse forty-eight hours, and then strain the liquor through the flannel bag.

XXXIV. *An admirable oil of sugar.*

Rinse a matrass with vinegar, put in it some dry powder sugar, or lump sugar pulverised. Keep that matrass on hot ashes, turning and whirling it round and flat ways, by means of the neck of the matrass which you hold in your hands with a cloth, and stop it not. The effect is such, the heat occasions the vapours to rise about the matrass, which by turning and whirling it, as above mentioned, makes the sugar which is in it resoak and imbibe them again. This operation dissolves the sugar, and reduces it into a sort of oil.

XXXV. *An admirable essence of red sugar.*

1. Pulverise five pounds of the best double refined, or royal sugar; which done, put along with eight ounces of brandy in a large matrass, over a sand bath. Distil some part of this first, on a slow fire, to avoid burning the sugar. Re-put the distilled liquor over the sugar again in the matrass. Continue to distil and pour the liquor again in the matrass over the sugar, till the sugar becomes red, which will happen at the seventh or eighth iteration of distillation.

2 Now distil out all the brandy, and on the remaining sugar pour common water, which distil also, then add some more, continuing so to do till you have drawn out all the tincture of the red sugar.

3. Take next all these red waters, and run them through the filtering paper, then distil the phlegm on a gentle fire to siccity (or dryness). Put again this distilled plegm on the residue. Which place all together in a cold cellar. You will find some red crystals, which pick up, and when dry, pulverise; then pour brandy over to dissolve. This admirable quintessence of sugar has the virtue of preserving the radical moistness of the inside, and our health.

XXXVI. *Another oil of sugar, excessively good.*

Cut off the end of a large lemon, of which squeeze out the juice; then fill it with fine sugar, and apply to it again the cut-off piece. Put it in a clean glazed pipkin, which place to boil a quarter of an hour; put it in a bottle; it will never congeal, and that oil is good for the stomach, colds, catarrhs, &c. The dose is one table spoonful at a time.

XXXVII. *How to extract the essence oil from any flower.*

Take any flower you like, which stratify with common sea salt in a clean earthen glazed pot. When thus filled to the top, cover it well, and carry it to the cellar. Forty days after put a crape over a pan, and empty all on it to strain the essence from the flowers by pressure Bottle that essence, and expose it four or five weeks in the sun, and dew of the evening to purify. One single drop of that essence is enough to scent a whole quart of liquor.

XXXVIII. *Essence of jessamine, roses, and other flowers.*

1. Take roses of a good colour, and fresh gathered. Pick all the leaves, which expand in the shade on a paper. For two or three days, during which you are to leave them there, asperse them, morning and evening, with rose water, stirring them each time.

2. When this hath been performed, put them in a glass, or varnished vessel, which stop as perfectly as you can, and place in the hottest horse-dung, which renew every five days. A fortnight after this, place the vessel in a *balneo mariæ*, adapting a bolt-head to it and a receiver, and lute all well. Distil the water, on which you observe the essence swimming. This you must divide by means of a wick, or filtering paper. Put the essence in a glass phial well stopped.

XXXIX. *The oil of cinnamon.*

Bruise first the cinnamon coarsely in a mortar, and put it a soaking in water, in which add a little pounded tartar, with a table spoonful or two of honey. Eight or ten days after place the vessel on a sand bath, and you will obtain by distillation, an excellent oil of cinnamon.

XL. *To draw the essential oil of roses.*

Pound in a mortar thirty pounds of leaves of roses with three pounds of common decrepitated salt; then put all in a pot well luted, which set in a cool place. Fifteen or eighteen days after, moisten well this matter with common water, stirring it till reduced into a pap. Then put it in an alembic with its refrigerator. Make a smart fire, which will send first the water, next the oil, susceptible of congealing by cold, and liquifying again by heat. One

drop of that oil gives more smell a hundred times than the distilled water from the same roses.

XLI. *An essence of jessamine.*

Dissolve over the fire, one quartar of a pound of sugar in a quarter of a pint of common water. After having skimmed it, boil it to a perfect evaporation; then take it off the fire, and fling two handfuls of jessamine flowers in it. Cover the vessel, and two hours after, strain the essence, and bottle it. It is an agreeable odour. The dose is one drop only, or two per pint of liquors.

XLII. *Essense of ambergris.*

Set to infuse, half a dozen of lemon peels in three half pints of spirit of wine, set them thus in a cold place for two days, in a vessel well stopped. After that time take off the peels, which squeeze through a linen, and put as many fresh ones in the stead, which reiterate three different times. When you take of the last peels, grind three grains of ambergris and one of musk, which put with the spirit of wine in a matrass over a gentle fire, till the amber is perfectly dissolved. There will fall some ground at the bottom of the matrass, decant the clear part from it in a bottle, and keep it for use.

Note. This essence might be made with the burning spirit of roses.

XLIII. *Essense of* capon *and other* fowls.

Cure the inside of any fowl, by taking away all the entrails. Fill it with lump sugar, pulverise and mixed with four ounces of damask raisins, perfectly stoned. Sew the fowl up again, and put it in a pipkin, which cover carefully with its lid, and lute all round with paste. Place this pot in an oven, when the bread goes in, and take it out along with it. Then uncover it, and strain the liquor through a cloth, with expression of the animal. This essence is the greatest restorative for old or enervated people; likewise to hasten the recovery of health after long illness. Take two large table spoonfuls early in the morning fasting, and as much at night after supper.

XLIV. *Virginal milk.*

1. Take one ounce and a half of benjamin; storax as much, and one of eastern white balm. Put all in a thick glass phial, with three half pints of spirit of wine, which

pour over. Put this in digestion over hot ashes, till the spirit of wine appears of a fine red colour.

2. To use it, put four drops in half a pint of water, and it instantly turns as white as milk.

3. Exteriorly used, it whitens the skin, if you wash with it; it has likewise the same effect upon teeth, by rinsing the mouth and rubbing them with it. Interiorly taken, it cures the heats and burning of the extinction of the voice.

XLV. *How to colour any sort of liquor.*

Bruise into a coarse powder some *santalum rubrum*, which put into a bottle with a discretionable quantity of spirit of wine poured over it. In five or six hours time the tincture will be very high; therefore it will be fit to give a colour to any liquor you chuse, by pouring some of it into the liquor, and shaking it till you find it is coloured to your liking.

XLVI. *A ladies fine* rouge *not hurtful to their skin like other* rouges, *wherein there always enters a mixture of lead or quicksilver.*

The above preparation of *santalum rubrum*, modified with common water to take off the strength of the spirit of wine and an addition of one clove, a little civet, a little cinnamon, and the bulk of a filbert of alum, per quarter of a pint of liquor, with safety.

XLVII. *A fine smelling water, at a small expence.*

Take two quarts of rose-water drawn by distillation in *balneo mariæ*, which put in a large bottle filled with fresh rose leaves Stop this bottle well with a cork and wax, then expose it to the sun, for a month, or six weeks; afterwards decant the liquor into another bottle, in which, for every one quart of liquor, add two grains weight of oriental musk, and cork it well. This water is of a charming fragrancy, and lasts a great while. It communicates the odour to them you touch after having rubbed your hands with it.

XLVIII. *To make an imitation of coffee.*

1. Take any quantity of horse beans, which put into a pan to roast over the fire, till they begin to blacken. Then take a little honey with the point of a knife and put it among the beans, turning them well with it, till soaked in the beans, repeating the same process till they are of a deep

brown chesnut colour. Now take them from the fire, and while they are quite burning hot, put for every large hanful of beans, half an ounce of *casia mundata*, with which imbibe them well by stirring and shaking in the pan as much as you can, and they are done.

2. These grind in the mill and make coffee of, it will have the same taste and flavour as the true Moca-coffee, so as not to be distinguished from it by the greatest connoisseurs.

Note. This coffee may be drank either thick or clear, with sugar as usual.

XLIX. *Another way.*

Take a quart of rye, which clean and roast as the beans in a pan till of a fine brown, then grind it. To use it, mix it half and half with the true coffee, and make it as usual, by putting it in boiling water and letting it boil five minutes.

Note. This coffee is much used among the people of quality, who prefer it to strengthen the stomach, especially when taken before going to bed.

L. *Directions for preparing the true coffee.*

1. True coffee must be roasted in an iron pan, or in a glazed earthen pan, over a clear charcoal fire without flames. Turn it with a stick while it is on the fire, to make each grain roast more regularly and equally. It is well roasted when it is all of a dark brown.

2. There is a much better method of roasting it, by means of a certain iron drum made in the form of a ladies muff-box, with a handle at one end, an iron peg at the other, and a latch door in the middle. By this door you introduce the coffee, which you fasten in it by means of a latch Then propping it on the top of a chafingdish made on purpose, in which there is a charcoal fire, you roast the coffee by turning the drum over it with the above mentioned handle; and thus the coffee roasts in the most regular manner.

3. When the coffee is roasted, grind it, keep it closely confined in leaden boxes, with a screwing lid. However it is still much preferable to grind no more at a time than what one wants to use at once.

4. The liquor is made by putting one ounce of that powder to three quarters of a pint of boiling water to make three full dishes. And, after an infusion of ten minutes, during which it is kept boiling, the coffee is fit for drinking.

LI. *A receipt for making chocolate.*

1. Dissolve in a copper pan some pulverised royal lump sugar, with a little orange water. When the sugar is turned into a syrup throw in the cocoa, the vanellee, the cinnamon, Mexican pepper, and cloves, all, and every of which ought to have been first reduced into an impalpable powder. Stir all well while it boils; and when you judge it to be sufficiently done, pour the paste on a very smooth and polished table, that you may roll it, and give it whatever form and shape you like.

2. To prepare it with either milk or water, in which, when boiling hot, you first dissolve it, then, with a box-mill, with a long handle, you mill it to froth in the pot in which it is making, and pour it afterwards in cups to drink.

CHAP. XIV.

SECRETS RELATIVE TO THE CONFECTIONARY BUSINESS.

I. *Raspberry syrup.*

MASH the raspberries, and dilute them with a moderate addition of water, then strain them to divide the thick from the clear part. To every quart of this clear liquor put one pound of lump sugar pulverised, boil all together on the fire in the preserving pan. Skim and clarify carefully the sugar with the white of an egg beaten in water. When the syrup is come to its right degree, (which you may know by throwing a drop of it in a glass of water, if the drop sinks whole to the bottom, and fixes itself there without running out along with the water, when you throw this away) take it off the fire, and let it cool for bottling.

II. *Apricot syrup.*

Cut in small bits six pounds of very ripe apricots, which boil in a gallon of water till they are reduced to a pulp. Let them cool, then squeeze them through a sieve. Now strain again this liquor through the jelly-bag, and put it in the preserving pan on the fire, with four pounds of sugar. Skim, clarify, and boil the whole to a syrup, which try as above directed in a glass of water; and, when done, let it cool, and bottle it to keep for use.

III. *The* verjus *syrup.*

Have *verjus* in grapes, which pick out of its stalks, and pound in a marble mortar. Strain it through a sieve first, then through a jelly-bag to get it finer. To two quarts of this juice, put into a preserving pan, add four pounds of sugar, and boil it according to art to a syrup.

IV. *A general manner of making syrups, applicable to almost all sorts of fruits, especially currants.*

1. Pick a quantity of red currants of all their stalks, and squeeze them through a sieve in a commodious vessel. Carry this vessel to the cellar, placing it on a stool, or any suspending shelf from the ground; and, after the juice

shall have worked three or four days, strain it through a sieve in another vessel, then through the flannel bag to get it as clear as possible.

2. Now for every two quarts of such liquor, have four pounds of sugar, which put in a preserving pan, and melt over the fire, with a little common water to help the dissolution of it. Boil it thus to the consistence of caramel, without burning it; and, when at that degree, pour through the holes of the skimmer the measured liquor, which must boil also to a perfect syrup according to the afore-prescribed trials. All this being well executed, take it off, let it cool, and bottle it for use.

Note. All sorts of syrups, such as cherries, raspberries, and others, may be made in the same manner, with this difference only, that they are not to be put to work in the cellar, but employed directly as soon as the juice is squeezed out of the fruits.

V. *To make liquid currant jam.*

Pick four pounds of currants, and clear them of their stalks. Put aside two pounds and a half of them in a dish, and squeeze the other one pound and a half remaining.—Now, in a preserving pan, dissolve four pounds of sugar; and, when come to a syrup, put in the two pounds and a half of whole currants along with one pound and a half of juice of the same, and boil all together to perfection.

VI. *To make the same with cherries.*

Have two pounds of the finest cherries, take off both tail and stones. Press out the juice of them and put it in a preserving pan with a pint of water, and four pounds of sugar. Boil all together, then add six other pounds of the finest cherries, from which the tails only, and not the stones, have been picked. Boil all to a syrup, and when this stands the trial of the glass of water, as mentioned above, all is done, and fit for potting.

VII. *Another way to preserve cherries.*

Put eight pounds of cherries *either with or without their stones*, in an earthen pan over a moderate charcoal fire, to evaporate their superfluous moistness; keep incessantly stirring, taking care to avoid mashing them. Then add four pounds of lump sugar pulverised, continue to stir the cherries, and boil all, so that the bubbles should cover the fruit, and that the syrup might hereby be skimmed till done to perfection when a drop of it runs with difficulty, being cold; then the cherries are fit to pot.

VIII. *To make the liquid raspberry jam.*

Boil, to a strong syrup, four pounds of sugar. When done, take the pan off the fire, and put in four pounds of raspberries well picked, and not mashed in the least. Put them in gently at first, and with a very particular care, for fear of squeezing them; for, when the heat of the syrup has once seized them, they are not so apt afterwards to break. Stir them therefore a little in the sugar, and when they have thrown in their juice, put them again on the fire, to complete the making of the syrup.

IX. *To preserve apricots.*

Chuse a quantity of apricots, just turned, but not ripe, and the fruit of which has still all its hardness and greenness. Take out the stones by means of a small bladed knife, which introduce at the point of the apricot till you feel the stone, and then push to make it come out at the tail. When you have thus prepared four pounds of them (weighed after stoning) have a large wide pan of boiling water on the fire, in which throw them in order to blanch them, taking great care that they should not spot in the water. When blanched, take them out with a skimmer, and set them a-draining on a sieve. Then boil and clarify four pounds of sugar into a syrup. When done, take it out, and put in your apricots softly, set them again on the fire, and give them two or three bubbles; take the pan from the fire and let them cool. By this means they throw off their superfluous moistness and take the sugar. When cold, take them from the sugar with a skimmer, and set them a-draining, while you put the syrup on the fire to boil. When drained, put them again into the boiling syrup, and give them five or six bubbles more, after which let them rest till the next day, put them again on the fire, and finish them. They will be what is called Liquid, and you may pot them in that state.

X. *How to make a dry preserve of them.*

Proceed as above directed, till the time they are fit for being potted in liquid, instead of which take them again out of the syrup, and set them a-draining, then range them on slates at regular distances, so that they may not touch one another. When thus prepared, powder on them, through a silk sieve, some of the finest loaf sugar pulverised, and put them in the stove to dry. When dry on that side, take them out from the slates, and turning them the other side upwards on a sieve, or some sort of small light

willow grates made on purpose ; powder them with sugar as before, and when equally dried and cooled, you may put them in boxes with white brown paper.

Note. All sorts of plums admit of the same mode of operation, to make them into dry or liquid preserves.

XI. *To preserve green apricots.*

1. Gather apricots, when green and fresh. Then pound some salt in a mortar, and make it as fine as possible, and putting a handful of this salt in a napkin, with as many apricots as you can well manage, fold the napkin, lengthways, bringing the long sides of it over the apricots, and taking the ends of it gathered one in each hand, shake and roll them backwards and forwards with the salt in the napkin, adding a spoonful or two of vinegar, which pour over them when thus agitated. This is to cure them of their down, and when this is obtained, throw them in cold water, and continue so to do with the rest.

2. Having well washed them in that first water, put them into new cold water, after which put them draining on a sieve. Then boil some water, and throw them in, where they are to be kept boiling till they are soft, which try now and then, by taking one or two with the skimmer, and thrusting in a fine skewer ; if this gets an easy admittance in the apricots, they are sufficiently done. Now take the pan from the fire, and with the skimmer take the apricots from that boiling water into some cold.

3. When your apricots are in this condition, make a syrup with as many pounds of sugar as you have fruit, and having put in your apricots, let them boil very gently — They will immediately turn of a very fine green. You must not press on the finishing of them ; on the contrary, take them off the fire, and give them a couple of hours rest, during which they throw off their moistness, and take the sugar. After they have thus rested, set them again on the fire, and finish them as fast as you can, that they may preserve their greenness.

XII. *To make the* Cotignac *liquid.*

Pare the quinces, and cut them small, after having taken away the cores and kernels. Put a gallon of water a boiling, then put them in, and let them boil till reduced almost to a pulp. Strain all through a cloth, and squeeze it well into a bowl. Then set it on the fire in the preserving pan, with four pounds of sugar, and boil it gently, till taking some with the skimmer, and letting it fall on a plate, it shall rise up like a jelly, push on the fire, and in five minutes after the *Cotignac* is done.

Note. If you put the peel and kernels into a knot, and boil them in that manner in the water, the jam will sooner be red.

XIII. *To preserve quinces in red.*

1. Chuse the most even quinces not stony. Cut them into four or eight quarters as you like best, then pare and core them. If you meet with any stones in the quarters, cut them off too. As you prepare them thus, throw them into cold water. Save the peels and cores, and mixing among them when all your fruits are prepared, such of them as are small, crooked, and otherwise ill formed, and unfit, to go along with the others, boil all in a sufficient quantity of water, to make a strong decoction which pass when done, and strain through a strong cloth into a pan.

2. In this decoction put other quarters and boil them in the preserving pan. When sufficiently done, put as many pounds of sugar as you had fruit. Boil this gently, and in a short time the quinces will become most beautifully red. When they are come to perfection, take them off the fire and pot them, but do not cover them for a day or two after.

XIV. *To do the same in white.*

1. You must not make the decoction of the parings. When the fruit is pared, you must throw it into boiling water, and let it continue to boil on the fire, till sufficiently done; then take it out with the skimmer, and put it draining on the sieve.

2. While they are thus draining, make a syrup; and when this is skimmed and clarified properly, put your fruit in it boiling. Ten minutes after, take the pan from the fire, and let all rest a while, then squeeze on it the juice of a lemon to whiten the quinces; and setting them again on the fire, finish them quickly.

XV. *To preserve* rousselet, muscadine, *and other pears.*

1. Chuse *rousselet* pears, which should be neither too ripe nor too green; which pare very neatly, and boil in water till properly done. Before boiling them observe to strike them to the heart from the head, with the point of a knife. When properly done in the boiling water, take them out with the skimmer, and throw them into fresh water.

2. Make next a syrup, with as many pounds of sugar as you have pears, in which put these, and boil them five or six minutes at first, then take them from the fire; and

let them rest a while to throw out their superfluous moistness, and take the sugar. That done, set them again on the fire, to complete them quickly.

Note. By doing as above, you will have a liquid preserve of pears, if you want to have them dry, follow the directions in Art. x. with respect to apricots.

XVI. *A firesrve of green almonds.*

1. Prepare a lye of pearl-ashes, in which wash your almonds to rub their down off. Wash them in another water, then in boiling water, where they are to boil till softened, but not to open, which try now and then, by thrusting a fine skewer in some of them. When done enough, skim them out from this water, and throw them into cold, then set them draining in a sieve.

2. Now make a syrup, and throw your almonds in while boiling. They will immediately recover their green; then finish them as expeditiously as you can, for fear they should turn black. If you want to keep them, you must put pound for pound of fruit and sugar.

XVII. *To make dry portable cherries.*

Prepare four pounds of fine *Kentish* cherries, by depriving them of their stones and tails. Then have one pound of sugar which put a dissolving on the fire in a pint of water. When this begins to boil, throw your cherries quickly in, and make them boil thus in the sugar till the syrup begins to thicken. When they are sufficiently done, take them from the fire, and let it cool, after which put them a draining in a sieve; then range them on slates, and powder through a sieve some sugar all over them, and place them in the stove, or for want of this conveniency, in a baker's oven, after the bread has been taken out. When dry on one side turn them on the other, and powder them over with sugar as you did before; dry them in the same manner, and box them when cold to keep for use.

Note. Plumbs may be done in the same manner. This sort of preserve is very agreeable, and may be carried any where.

XVIII. *To make an apricot, or peach jam.*

1. Chuse the ripest apricots, which clean of all hard knobs, spots and rotted parts. Cut them in small bits in a preserving pan, which have previously weighed. If you have put four pounds of apricots in it, reduce them by boiling over a gentle fire to two pounds only, which you must find out by weighing pan and fruit together, now and

then, till you find your right weight. When this is the case, put among your apricots thus reduced to one half, two pounds of lump sugar pulverised, and mix all well for the space of five minutes over the fire, then take all off, let it cool, and pot.

2 This composition you may put into paste, on slates or in tin moulds. There is not more exquisite eating. You may also with two or three roasted, or baked apples, mix two spoonfuls of this marmalade, and make excessive nice tarts with it, or again, with pears baked under ashes.

XIX. *An apricot jam, after the* French *way.*

1. Chuse such ripe apricots as are fit to eat. Peel their skin off very neatly, and give them a bubble or two in boiling water, so as not to have them dissolve in the water, and put them draining. When done, mash them through a sieve, and let them rest a time to evaporate their superfluous moistness.

2. While this is doing, make a syrup with as many pounds of sugar as you have fruit, and take it off the fire; when the syrup is cooled, put your fruit in, which stir well with the spatula, then put all again on the fire for ten minutes, in order to make the fruit take well the sugar. When the jam is well done, fine and transparent, pot it.

XX. *To make raspberry, currant, and cherry jam.*

All these fruits must be squeezed through a sieve, then clarify the sugar, and throw in the juice, bring to perfection afterwards as directed in the last receipt.

XXI. *To make a good currant jelly.*

Have four pounds of currants, after picking. Then dissolve in water four pounds of loaf sugar, which make into a pretty strong syrup. Now put the currants in, and boil so as to have them covered with the bubbles. Six minutes after such a boiling, take the pan from the fire, and pour the contents in a sive, to strain off all the liquid. Put this liquor again in the pan and boil it, till taking a drop with the skimmer, and pouring it on a plate, it congeals as it cools. Then it is fit to pot.

They who want to spare the sugar, and have a great deal of jelly, at a smaller expence, may employ four pounds only of sugar to six of currants, after picking, and proceed as above. They must however observe to do the jelly rather more than in the preceding case, when the fruit and sugar are pound for pound.

XXII. *To make an apple jelly.*

1. Cut in small bits a dozen of gold rennets, and put them in the preserving pan, with three quarts of water, which boil to the reduction of one half. Throw all in a cloth to strain it through, and draw all the juice from the apples. Then to this put four pounds of sugar, which boil to a jelly.

2. To give a *pointe* to that jelly, you may add the juice of one lemon, and even the rasping of one half of its rind.

XXIII. *A conserve with raspings of Portugal oranges and lemons, conjointly or separately.*

Put your raspings to dry in a plate. Prepare some sugar into a syrup. Take this from the fire, and stir it with a spoon, round the pan and in the middle; then throw in your raspings of lemon or orange, or both together, and having stirred all well, put it in the moulds and make your drops.

XXIV. *To whiten cherries, currants, raspberries, grapes, strawberries, and such like fruit.*

Beat one or two whites of eggs with orange flower water, then steep your fruit in, and roll it afterwards in a dish wherein there is lump sugar pulverised and sifted very fine. When it is well covered over with sugar, put it on a sheet of paper, and set it in the sun to dry. You may thus ice all sorts of fruits susceptible of icing.

XXV. *To make Savoy biscuits.*

1. Separate the whites of four eggs from their yolks. Beat them by themselves to a very hard froth, at which time put the yolks, previously well diluted, and continue beating all together. Now introduce half a pound of sugar pulverised, and beat them all together again.

2. When you are ready to dress your biscuits, have a quarter of a pound of seperfine flour, which incorporate by beating well, then dress it on a sheet of paper in the form you like best, and ice them over with sugar in powder to prevent their running. Put them in an oven, no hotter than for massepins, and after a reasonable time they will be done.

XXVI. *To make bitter almond biscuits.*

Pound in a mortar, three quarters of a pound of bitter and one quarter of sweet almonds. When thus pounded

haveeight or nine yolks of eggs, which beatup and mix with your paste of almonds, and two pounds of pulverised lump sugar. This paste must be a deal harder than that of the Savoy biscuits. Then with the end of a knife taking some of that paste, place it in rows on a sheet of paper, in what form or shape you like, and ice is with pulverised sugar, then put it in the oven as you do the Savoy biscuits or massepins.

XXVII. *How to preserve orange peels all the year but especially in May.*

Cut some oranges, in four quarters and peel them. Then put the peels to soak in water for about ten or twelve days; then dry them between two cloths, and put them in a caldron with a sufficient quantity of honey to half cover them. Boil them thus one minute or two, stirring them incessantly. Then take them off the fire, and let them rest till the next day, put them on again, and let them boil ten minutes or a quarter of an hour. For six or seven days repeat the same operation, taking great care incessantly to stir, turn them all the while they are on the fire. On the eighth day change the honey, and in the fresh honey boil them five minutes, then pot them with that new honey in which they boiled last, and keep them for use after having added some cinnamon, cloves, and white ginger, mixed and both reduced into subtile powder.

XXVIII. *To make a paste with whatever fruit it may be.*

Take whatever quantity you please of any fruit, which peel and boil well in water, then strain the juice through a sieve or flannel. Now weigh ten pounds of that paste of fruit, and ten more of sugar pulverised. Mix first five pounds of sugar with ten pounds of fruit, and put it adoing on the fire; then mix four more pounds of your sugar When done, put with a spoon (on iron plates previously powdered with some of the sugar which was left) some of that paste. Set these to dry on a chafingdish, in the sun, or in the open air, turning and returning them often, and powdering them morning and evening with sugar. When these little cakes are perfectly dry, put them in Dutch deal boxes, and in white papers, that they may not touch each other.

Note. In the same manner you may make the conserve of roses, bugloss, burrage, red currants, &c.

XXIX. *Genoa biscuits.*

Take four ounces of sugar in powder, one pound of

flour, a little coriander and aniseeds in powder, which mix with four eggs and as much lukewarm water as needs to make a dough of the whole. Bake it in the oven, and when baked, cut it in five or six slices, which you bake again.

XXX. *The queen's cakes or biscuits.*

Take twelve ounces of flour, one pound of fine sugar in powder, and twelve eggs, from which take out three yolks, with coriander and aniseeds. Beat and mix all together. till it comes to a thick but running paste. Some add yeast to make it lighter and rise higher. Divide this paste into several paper cases, of the width of two fingers, and twice as long, which put in an oven to bake; but take care that it be not too warm.

XXXI. *Macaroons.*

Pound well one pound of sweet almonds, moistening them with rose water. Introduce one pound of sugar, and beat all well in a soft paste, which put round a dish, and half bake in a lukewarm oven. When the paste is half done, cut it in small round pieces, and having ranged them on a sheet of paper, finish baking them.

XXXII. *Particular method of making cakes.*

Wash and clean well a dozen of eggs, and wipe them thoroughly dry Then break them and take their whites only, which beat in a mortar along with their shells till these latter be perfectly dissolved. Now add sugar and flour, though not so much flour as sugar. When all is well mixed, spread the paste, which ought to be a little firm, on a sheet of paper, and after having glazed it, bake it in a slow oven.

XXXIII. *A cream which cuts as a rice pudding.*

Beat in a dish two whites of eggs and one yolk, in which, while you beat, introduce by degrees a quarter of a pound of sugar, in proportion as it melts, and a pap spoonful of rose water. When completed, pour in the dish, and stir, a quart of milk and cream mixed half and half, then set it gently on warm cinders, to take without boiling, not disturbing it any more. In an hour's time it generally is sufficiently taken. Then colour it in passing a red hot shovel over it. It is to be served cold, after having rasped some sugar on it.

XXXIV. *To make an exceeding good boiled cream.*

Take cream from the cow, which boil with a crum of stale bread, rasped very, fine, and a little fresh butter. As soon as it begins to quake, stir it continually with a spoon; and having diluted some yolk of eggs strain them through a cloth. Put as much salt and sugar in your cream as you think it requires. And when it boils and begins to rise, pour the yolks of eggs in, never ceasing to stir it in order to prevent its rising so far as to run over. As soon as you see it begins to render the butter, take it out of the fire, and to serve, glaze it over with sugar in power.

XXXV. *A method of making cakes exceeding fine.*

Take two whites of eggs, which beat well to a froth, after having taken away their germen. Add one quarter of a pound of fine flour, and as much powdered sugar. Beat all well, and add a little brandy and coriander seed powdered. All being well mixed, spread the paste on sheets of white paper, glaze it over with powdered sugar, and put it to bake.

CHAP. XV.

SECRETS RELATIVE TO THE ART OF PREPARING SNUFF.

I. *How to reduce tobacco into powder.*

UNCORD the tobacco, and spread the leaves to dry in the sun. Then pound them in a mortar, and sift through a coarse sieve to get the coarsest powder out of it. As for sifting, observe to do it in due proportion as you pound it, and not to pound much at a time. You may also take another method, that of grinding it in one of those small mills which are made on purpose for grinding tobacco. By these means you may, without much trouble, make it as coarse and as fine as you like, by screwing tighter or slacker the nut.

II. *How to purge snuff, and prepare it for admitting of odours.*

Have a small tub pierced with a hole at bottom, which you may stop and unstop with a cork as you want it. In this tub put a very thick and close weaved cloth, which turn over the rim of the tub and fix there by the outside. Put your snuff in it, and pour water over it. After it has soaked thus twenty-four hours, unstop the hole of the tub and let the water drain away, wringing the cloth in which it is to help the expression of the water. Repeat this operation three different times to purge it the better. When this operation is performed, set the snuff to drying in the sun When dry, put it again in the tub in the same manner as before, and soak it again, not with common water, but with some smelling ones, such as for example, orange flower water, *eau d' ange*, &c Twenty-four hours after let the water run off and drain, then set it in the sun to dry as before. In the mean while stir and asperse it again with smelling water. Such is the indispensible preparation absolutely requisite to dispose snuff to receive the odour of flours. If you do not care to have it so perfectly nice, and should not like to waste so much of it, you may give it but one wash of the common water. This moderate purgation will do pretty well especially if, while it is a drying in the sun you knead it the more often in proportion with your fragrant water, and let it dry each time between.

III. *How to perfume snuff with flowers.*

The tuberose, the jessamine, the orange flowers, &c. and those which communicate the more easily their fragrancy to the snuff. To produce this, have a box lined with white paper perfectly dry, in which make a bed of snuff of the thickness of an inch, then one of flowers, another of snuff, and another of flowers again, continuing so to do till you have employed all your snuff. After having let this stratification subsist for twenty-four hours, separate the flowers from the snuff by means of the sieve, and renew the same stratification again as before with new flowers. Continue thus to do till you find that your snuff has acquired a sufficient fragrancy from the flowers; then put it in lead boxes to keep it.

IV. *Snuff of* mille-fleurs.

The *mille-fleurs*, or snuff of one thousand and one flowers is made by mixing together a number of various odouring flowers, managing the quantity of each of them according to the greater or lesser degree of fragrancy they are empowered with, so that none could be found to have a predominancy over the other. When that is executed, you proceed, as before directed, to the alternate stratification of this mixture and of the snuff powder.

V. *The odouring snuff after the method practised at* Rome.

Take the snuff after its being perfumed with flowers, and put it in a large bowl or other proper vessel. Pour over it some white wine with an addition of essences of musk and amber, or any other such like odours. Then stir your snuff and rub it all between your hands. In this manner you may have snuff of whatever odour you desire, which, to distinguish from each other, you put into separate lead boxes with a particular mark.

VI. *Amber-snuff.*

Heat the bottom of a mortar, and pound it in twenty grains of amber, adding by degrees a pound of snuff to it, which rub and mix afterwards with your hands to introduce the odour the better among it.

VII. *The odouring snuff, Malthese fashion.*

Take a snuff ready prepared with orange flower water,

(as directed art. ii.) then perfume it with amber as we have just said; after which with ten grains of civet, pound with a little sugar in a mortar, introduce again your snuff, by degrees, to the quantity of a pound for these ten grains, increasing either the snuff or the odours in the same proportion to each other.

VIII. *The true Malthese method of preparing snuff.*

Take rose tree and liquorice roots, which peel and reduce them into powder and sift it, then give it what odour you like, adding white wine, brandy or spirit of wine, and mix your snuff well with this. Such is the true Malthese method of preparing snuff.

IX. *The Spanish method of preparing perfumed snuff.*

1. Pound in a small mortar twenty grains of musk with a little sugar. Add by degrees as much as a pound of snuff to it; then pound ten grains of civet, and introduce your musked snuff to it in a gradual manner as before, and rub altogether between your hands.

2. The Seville snuff is the same with only an addition of twenty grains of *vanilla*, an ingredient which enters in the composition of chocolate.

3. They who are found of a milder and sweeter odour in their snuff may increase the quantity of snuff for the prescribed doses of odours, or diminish the doses of odours prescribed for the quantity of snuff. Take care not to let odouring snuff be exposed to the air, but keep it very close for fear it should lose its fragancy.

4. As the Spanish snuff is excessively fine and drawing towards a reddish hue, to imitate it in the above prescription you must chuse fine Holland well purged, reddened and granulated pound and sift it through a very fine silk sieve. Then give it whatever odour you like, after having purged it in the manner we prescribed in this chapter art. ii.

5 There is no inconveniency in taking a snuff already prepared with flowers, to give it afterwards an odour of amber, musk, and other perfume. On the contrary, such a snuff is the readier to take the other odours, and preserve them so much the longer.

CHAP. XVI.

SECRETS OF TAKING OUT SPOTS AND STAINS.

I. *To take of iron-moulds from linen.*

PUT boiling water into a bowl, and spread the stained parts of your linen over it, as to be well penetrated with the steam of the water. Then rub the places with sorrel juice and salt till they are perfectly soaked. Such linen washed afterwards in the lye of wood ashes, will be found to return entirely free from the iron mould spots it had before.

II. *To take off carriage wheel grease from cloaths.*

Rub the place with butter. Then with blotting paper and a hot iron you may take all off as you would a drop of wax or tallow on a cloth.

III. *Against piss spots.*

Boil some chamber-lye and wash the place with it. Then rinse it with clear water.

IV. *To take off spots from cloth of any colour.*

Take half a pound of crude honey, the yolk of a new laid egg, and the bulk of a nut of ammoniac salt. Mix all together, and put some on the spots. Having left it there a while, wash the place with clean water, and the spot will disappear.

V. *A receipt against all sorts of spots upon stuff.*

A water impregnated with alkaline salt, black soap and bullock's gall take off extremely well the greasy spots from any cloth or silk stuff.

VI. *Against oil spots.*

Take a piece of white soap, shaved very fine, and put in a quart bottle with a wide mouth and neck, half filled with lye. Add to this the bulk of a nut of ammoniac salt, two yolks of eggs, cabbage juice and bullock's gall a dis-

cretionable quantity, one ounce of salt of tartar in subtile powder sifted. Stop the bottle well, shake it and expose it to the sun for four days. After that time if you pour off that liquor on any oil spot, and rub it well with it in and outside, then let it dry, and wash it again with clear water.

VII. *A washing ball to take out spots.*

Take fuller's earth, or soft soap incorporated with vine brush ashes, white chalk, alum and tartar, pounded all together in a mortar and sifted through a fine silk sieve. When all is made into a paste form your balls with it, and let them dry in the shade. To use them, rub any spotted place with it, and wash it afterwards with clear water.

VIII. *To take out pitch and turpentine spots.*

Rub well the spot with oil of olive, which set to dry for one day. Then with warm water and the above washing ball, you will entirely ungrease the place.

IX. *Against ink spots, whether on cloth or linen.*

Wet immediately the place with lemon, or sorrel juice, or with white soap diluted in vinegar.

X. *Another simple remedy against ink when just spilled.*

The time spent in lamenting over an accident just happened, is but too often the only one which could have saved and prevented the dire consequences of it, nay perhaps have repaired it entirely without leaving the least scar behind had we ran instantly to the remedy. If the ink be spilt on a ruffle or apron, &c. while you have it on, let one hold the affected part between his two hands over a bason and rub it while another is pouring gradually water from a decanter, and let a whole pitcher full be used if necessary. If the ruffle, apron, &c. be at liberty and not on, the place dipped into a bason full of water, and there squeezed and dipped in again, may do, provided you change the water in abundance every two or three squeezes If the ink be spilt on a green carpet table, it may immediately be taken out with a tea spoon so dexterously that any water at all shall hardly be wanted afterwards provided it was only that instant spilt, as the down of the cloth prevents the immediate soaking of the ink or any other liquor, (except oil) but if it has laid ever so long,

provided it is still wet, by pouring a little fresh clean water at a time on the place, and gathering it up each time with a spoon, and pressing hard to squeeze it out of the cloth into the spoon again, you will at last bring it to its natural colour, as if no such accident had ever happened.

XI. *Against oil spots on satin, silks, stuffs, or paper.*

If the spot is fresh done, heat on the shovel some ashes from calcined sheep's trotters; put some under and upon the place. Then laying something heavy upon it, let it stay for one night; the next morning the spot ought to be gone; but if not quite renew the precept.

XII. *A preparation of balls against spots.*

Take half a pound of soap, four ounces of clay, and one of quick lime. Dilute all with a little water, and make it into pills or small balls. With these rub the spots, and wash the place afterwards.

XIII. *For silks.*

If you rub the spots which are upon a silk with spirit of turpentine, they will disappear; because the volatility of that spirit exhaling into vapour, carries along with it the oil of the spot to which on account of its homogeneous quality, it communicates its volatility, by penetrating and subdividing it infinitely.

XIV. *To restore gold and silver lace to their former beauty.*

Mix equal quantities of water, bullock's and jack's gall, With this composition, rub your gold or silver, and you will see it changing colour directly.

XV. *To restore Turkey carpets to their first bloom.*

Beat the carpet well with a rod, till perfectly free from dust. Then if there be any spots of ink, take them out with a lemon, or with sorrel, and wash the place afterwards with clear water. Shake the rest of the water off, and let it dry, rub the carpet very hard all over with the smoaking hot crum of a white loaf; and when you find in the evening the skies clear and a likelihood of being a fine night, let the carpet be put out for two or three such nights.

XVI. *To make tapestries resume their first brightness, when their colours have been tarnished and spoiled.*

Shake and clean well the tapestry by rubbing it all over with white chalk, which leave on it for about one day. Next with a rough hair brush get all that chalk out again, and put on fresh, which leave as before. Then with the same rough hair brush get this out also, and beat it soundly with a rod, and brush it afterwards with the soft cloth-brush. This operation will restore a tapesty to its pristine state.

XVII. *To take off spots of wax from velvet of any colour except the crimson.*

Take the crum of a stale loaf, and cut a thick slice out of it, which toast and apply, while burning hot on the spot of wax; when cooled, renew it till all the wax is soaked out of the velvet.

XVIII. *To take the same from silks and camblet.*

Put on each wax spot, some soft soap, and set it in the sun till grown warm; then by washing the place with clean water, the spot will disappear.

XIX. *To wash a gold or silver, or silk embroidery, or any stuff whatever, and render it like new.*

Take bullock's gall, a pound, soap and honey, three ounces of each, and Florentine orrice, about the same quantity in subtile powder. Put all in a glass vessel, in which mix it well into a paste, and let it be exposed for ten days in the sun. When you are ready to use it, make an infusion of bran, which boil in water and strain through a cloth. Then smear the work over with the above described paste, in such places as you want to clean, and wash them afterwards with bran water, renewing this till it receives no more alteration in its colour. Wipe well the places with a white cloth, and wrap the work in a clean napkin to set it in the sun to dry, after which pass it through the polishing and lustring press, and the work will be as fine and bright as when new.

XX. *To take the spots off from silk and woollen stuffs.*

Take French starch without any mixture of indigo or blue whatever, which dilute in a cup with good brandy like

a thick pap. Of this paste, put on each spot, and when dry rub it off and brush it. If the spot is not quite gone the first time, renew the operation and it certainly will the second.

XXI *To colour velvet in red.*

Take four ounces of adragant, and one of arabic gums, both of which pulverise. Put this powder in clean water, wherein let it dissolve for two or three days; then steep a sponge in the liquor, and rub the wrong side of the velvet. If after being dry, you find it not high coloured enough, renew it, and the effect will surprise you.

XXII. *To revive the colour of a cloth.*

Pour one quart of water on one pound of burnt pot-ashes. Twelve hours after decant the water off in another vessel, and put in a handful of dry moth mullein leaves, with two bullock's galls. Boil all together till the leaves go to the bottom. Then set this water for a few days in the sun. Then putting in it whatever colour you want, boil it with the cloth in that lye, and let it thus soak afterwards fourteen or fifteen days, then the cloth will have resumed its primary colour.

XXIII. *To take the spots off from a white cloth.*

Boil two ounces of alum for half an hour, in a pint, or a pint and a half of water; then put in a piece of white soap, with another pound of alum; and having soaked thus three days in the cold, you may with it wash all the spots of any white cloth whatever.

XXIV. *To take off the spots from crimson and other velvets.*

1. Take a pint of lye made of vine branch ashes, in which dissolve half an ounce of alum dregs. When settled, strain it through a cloth; then take another drachm of alum, half a drachm of Spanish, and as much of soft soap, a scruple of common, and half a drachm of ammoniac salts, a calfs gall, and a little calendine juice. All being well mixed, strain and keep it for use.

2. Before using, take the quantity you think to have need of in a cup, in which put a little brazil wood and *bourre d' ecarlatte* (or goat's hair, from the dyers, dyed with madder) to boil a bubble or two, then strain through a cloth. In that state, your preparation will be fit to take off the spots from crimson, either cloth or velvet.

Note. For cloths or velvets of other colours, tinge your liquor with *hourre*, or goat's hair of the same colour.

XXV. *To take off an oil spot from cloth.*

Take oil of tartar, which put on the spot, then wash it immediately with lukewarm water, then with two or three cold waters, and it will be perfectly cleansed.

XXVI. *A composition of soap to take off all sorts of spots.*

1. Take a pound of Venetian white soap, six yolks of eggs and half a spoonful of salt pounded. Incorporate all together with a sufficient quantity of the juice from the leaves of white beet. Make this composition into small cakes, which dry in the shade.

2. To use them, wet the place of the cloth where the spot is, with clear water, and rub it over on both sides with the said soap, then washing it the spot will disappear.

XXVII. *To take the spots from a white silk or crimson velvet.*

Wet the place well with brandy of three rectifications or with the best spirit of wine, then smear it over with the white of an egg, and set it to dry in the sun. When dry wash the place with clean water, passing and squeezing it between your fingers, and if the spot is not gone at the first operation, it will not fail at the second, therefore renew it.

CHAP. XVII.

ESSAYS ON VARIOUS ARTS AND TRADES.

I. *A very strong glue*

SOAK the finest ichthyocolla (isinglass) twenty-four hours in spirits of wine or strong brandy; then boil all very gently together, continually stirring it that it may not burn, until it becomes one liquor. Then strain it while hot through a coarse linen cloth, into a vessel where it may be kept close stopped; a gentle heat will melt this glue for to use.

II. *Another glue.*

Glue is made in Europe of the ears, feet, trimmings, sinnews and scrapings of the skins of oxen, calves, sheep, &c. old leather, and fresh or raw hides mixed are manufactured together; and this mixture is said to yield one third of its weight in good strong glue. The best glue is from the hides of old animals. Whole skins are very seldom used, unless they are much injured by the worm, rotted, or otherwise rendered unfit to make leather; but the smallest pieces are saved for the purpose.

In making glue of pieces of fresh skins, let them be steeped in water for two or three days. Dried hide may require longer time, and bits of leather much longer. While soaking they should be stirred occasionally. Then put them to drain in hand barrows with grated bottoms, or in boxes with sloping sides and grated bottoms. When drained, let them be well washed in several waters. The ears and other dirty parts should be steeped and washed by themselves. After they be washed clean, put them into a weak lime-water, in iron hooped tubs. Leather will require to be kept in a weak lime-water a considerable time, and a little fresh lime should be added occasionally. Allumed skins, tallowed, greasy, bloody, or hairy skins should be put into a stronger lime-water, and kept longer in it. They sometimes require to be taken out, so as to permit the lime to dry on them, and to remain for a considerable time; after which they must be again soaked, and well stirred; then press them out as dry as possible, and put them into a copper kettle for boiling, at the bottom of which kettle should be a wooden grate. The copper should be filled with the materials pressed close, and as much water poured on as will run among the pieces. Make a moderate fire, which increase by degrees, till it boils. As the materials melt into glue, some decrease

the fire without stirring them; others stir them as they dissolve. When the glue, on cooling, forms a pretty thick jelly, it is done. The time of boiling is from twelve to fifteen hours, according to the fire. Violent heat is to be avoided.

After this a box is made with wooden gratings for the bottom; the inside of the grating bottom it is to be lined with horse hair cloth, and the box to be placed over a large tub; the glue is to be passed through this horse hair cloth, or strainer, quickly, while it is very hot. The dregs are left to drain sometime, and are called by the workmen glue dung; they make an excellent fuel, mixed with wood. The room should be kept warm while the glue is settling. In the tub there should be cocks to draw off the hot liquid glue. The first glue will be brightest, but the last will be equally good. Through the cocks it must run into flat moulds, previously wet. When cool, cut it out with a wet knife into squares, and hang it on a line to dry and harden, in a draught of air. Some place it on a net, hung on four posts, turning it occasionally. Ten days of dry weather, or fifteen days of wet (under cover) are required in Europe; but less time will dry it in America. To polish the cakes, wet them, and rub them with new lime. The best glue has few dark spots, and no bad smell, and shines when broken. To try glue, put it into cool water for three or four days, where it must not dissolve, but when dried must preserve its weight.

III. *A parchment glue.*

Put two or three pounds of scrapings or cuttings of parchment into a bucket of water; boil the whole till it be reduced to half. Pass it through an open linen, and then let the liquor cool, when it will be parchment glue.

IV. *A strong paste.*

Common paste is made of wheat flour boiled in water till it be of a gluttenous or viscid consistance; but when used by book-binders and paper hangers, it is requisite to mix a fourth, fifth, or sixth of the weight of the flour of powdred resin or rosin; and where it is wanted still more tenacious, gum arabic, or any kind of size, may be added. In order to prevent the paste used in papering rooms, &c. from being gnawed by rats and mice, powdered glass is sometimes mixed with it. But the most effectual and easy remedy is to dissolve a little sublimate, say a drachm to a quart of the water used in making the paste, which will hinder not only rats and mice, but any other kind of vermin and insects from preying on the paste.

V. *Process for dying leather red and yellow, as practised in Turkey, with directions for preparing and tanning the skins, as communicated by Mr. Philippo, a native of Armenia, who received from the society for the encouragement of arts in London, one hundred pounds sterling, and also the gold medal of the society, as a reward for discovering this secret.*

First preparation of the skins, both for red and yellow leather, by dressing them in lime.

Let the skins, dried with the hair on, be first laid to soak in clean water for three days; let them then be broken over the flesh side, put into fresh water two days longer, and afterwards hung up to drain for half an hour. Let them now be broken on the flesh side, limed in cold lime on the same side, and doubled together with the grain side outward. In this state, they must be hung up within doors, over a frame, for five or six days, till the hair be loose, which must then be taken off, and the skins be returned into the lime pit, for about three weeks. Take them out, and let them be well worked, flesh and grain, every sixth or seventh day during that time; after which let them be washed ten times in clear water, changing the water each time. They are next to be prepared in drench, as hereafter mentioned.

Second preparation of the skins, for both the red and yellow dyes, by drenching.

After squeezing the water out of the skins, put them into a mixture of bran and water, warm as new milk in the following proportion, viz. about three pounds of bran for five skins, and water sufficient to make the mixture moderately flued, which will be about a gallon to each pound of bran. In this drench let the skins lie three days, at the end of which time they must be well worked, and afterwards returned into the drench two days longer; they must then be taken out and rubbed between the hands, the water squeezed from them, and the bran scraped off clean from both sides of the skin. After this they must be again washed ten times in clear water, and the water squeezed out of them.

Thus far the preparatory process of all the skins is the same, whether intended to be dyed red or yellow; but afterwards those which are to be dyed red, must be treated as follows:

Preparations, in honey and bran, of the skins that are to be dyed, red.

Mix one pound of honey with three pints of lukewarm

water, and stir them together till all the honey is dissolved. Then add two double-handfuls of bran, and taking four skins(for which the above quantity of mixture will be sufficient) and work them well in it one after another. Afterwards fold up each skin separately, into a round form, with the flesh side inwards, and lay them in an earthen pan, or other proper vessel; if in the summer, by the side of each other, but in the winter on the top of each other. Place the vessel in a sloping position, so that such parts of the fluid as may spontaneously drain from the skins may pass from them. An acid fermentation will then rise in the liquor, and the skins will smell considerably. In this state they must continue for seven or eight days, but the moisture that drains from them must be poured off once or twice a day, as occasion may require. After this, a farther preparation in salt is necessary, which must be performed in the following manner.

Preparation, in salt, for the skins to be dyed red.

After the skins have been fermented in the honey and bran, as before mentioned, let them be taken out of that mixture on the eighth or ninth day, and well rubbed with dry common sea salt, in the proportion of a bout half a pound to each skin, the salt must be well worked and rubbed with them. This will make them contract again, and part with a further considerable quantity of moisture, which must be squeezed out by drawing each skin separately through the hand. They must next be scraped clean on both sides from the bran, superfluous salt and moisture that may adhere to them. After which dried salt must be strewed on the grain side, and well rubbed in with the hand. They are then to be doubled with the flesh side outward, lengthways, from head to tail, and a little more dry salt must be thinly strewed over the flesh side, and rubbed in; for the two last operations, about a pound and a half of salt will be sufficient for each skin. They must then be put, thus folded on each other, between two clean boards, placed sloping breadthwise, and a heavy weight laid on the upper board, in order gradually to press out what moisture they will thus part with. In this state of pressure they must be continued two days, or longer, till it is convenient to dye them, for which they will then be duly prepared.

Preparations of the red, dye, in a proper proportion for four skins.

Put eight gallons of water into a copper, with seven ounces of shenan, the root of alkanet is also used, tied up in a linen bag. Light a fire under the copper, and when the water has boiled about a quarter of an hour, take out the bag of shenan, and put into the boiling fluid or lixivium,

1st. two drachms of alum; 2dly. two drachms pomegranate bark; 3dly. three quarters of an ounce of turmeric; 4thly. three ounces of cochineal; 5thly. two ounces of loaf sugar. Let the whole mixture boil about six minutes, then cover the fire, and take out a quart of liquor, putting it into a flat earthern pan; as when it is as cool as new milk, take one skin, folded lengthwise, the grain side outwards, and dip it in the liquor, rubbing it gently with the hands Then taking out the skin, hang it up to drain, and throw away the superfluous dye. Proceed in the same manner with the remaining three skins; and repeat the operation of each skin separately eight times, squeezing the skins by drawing them through the hands before each fresh dipping Lay them now on one side of a large pan, set sloping, to drain off as much of the moisture as will run from them without pressure, for about two hours, or till they are cold; then tan them as hereafter directed.

Tanning the red skins.

Powder four ounces of the best white galls in a marble mortar, sifting it through a fine sieve. Mix the powder with about three quarts of water, and work the skins well in this mixture for half an hour or more, folding up the skins fourfold. Let them lie in this tan for twenty-four hours, when they must be worked again as before; then taken out, scraped clean on both sides from the first galls and put into a like quantity of fresh galls and water In this fresh mixture they must be again well worked for three quarters of an hour; then folded up as before, and left in the fresh tan for three days. On the fourth day they must be taken out, washed clean from the galls in seven or eight fresh quantities of water, and then hung up to dry.

Manner of dressing the skins after they are tanned.

When the skins have been treated as above, and are very near dry, they should be scraped with the proper instrument or scraper on the flesh side, to reduce them to a proper degree of thickness. They are then to be laid on a smooth board, and glazed by rubbing them with a smooth glass; after which they must be oiled, by rubbing them with olive by means of a linnen rag, in the proportion of one ounce and a half of oil, for four skins; they are then to be grained on a graining board, lengthwise, breadthwise, and from corner to corner.

Preparation with galls for the skins to be dyed yellow.

After the four skins are taken out of the drench of bran, and clean washed as before directed in the second article, they must be well worked half an hour or more, in a mix-

ture of a pound and a half of the best white galls, finely powdered, with two quarts of clean water. The skins are then to be separately doubled lengthwise, rolled up with the flesh side outwards, laid in the mixture, and close pressed down on each other, in which state they must continue two whole days. On the third day, let them be again worked in the tan, and afterwards scraped clean from the galls with an ivory or brass instrument, (for no iron must touch them.) They must then be put into a fresh tan, made of two pounds of galls finely powdered, and about three quarts of water, and well worked therein fifteen times After this they must be doubled, rolled up as before, and laid in the second tan for three days. On the third day a quarter of a pound of white sea salt must be worked into each skin and the skins doubled up as before, and returned into the tan till the day following, when they are to be taken out, and well washed six times in cold water and four times in water lukewarm. The water must be then well squeezed out, by laving the skins under pressure for about half an hour, between two boards, with a weight of two or three hundred pounds laid upon the uppermost board, when they will be ready for the dye

Preparation of the yellow dye, in the proper proportion for four skins.

Mix six ounces of cassiare gehira, or degenira, or the berries of the eastern rhamnus buck thorn; sumach is also used, with the same quantity of alum, and pound them together till they be fine, in a marble or brass mortar, with a brass pestle. Then dividing the materials thus powdered, into three equal parts, of four ounces each, put one of those three parts into a pint and a half of boiling water, in a china or earthen vessel, and stir the mixture together. Let the fluid dye, thus prepared, stand to cool till it will not scald the hand; then spreading one of the skins flat on a table, in a warm room, with the grain side uppermost, pour a fourth part of the mixture first made, over the upper, or grain side, spreading it equally over with the hand and rubbing it well in. Afterwards do the like with the other three skins, for which the mixture first made will be sufficient. This operation must be repeated twice more on each skin, separately, with the remaining eight ounces of the powder of the berries and allum, with the abovementioned due proportion of hot water put to them as before directed.

The skins, when dyed, are to be hung up on a wooden frame without being folded, with the grain side outwards, about three quarters of an our to drain, when they must be carried to a river or stream of running water, and well washed therein six times or more. After this they must

be put under pressure for about an hour, till the water be squeezed out; afterwards the skins must be hung up to dry in a warm room. This being done, the skins are to be dressed and grained as before directed for those dyed red; except the oiling, which must be omitted.

VI. *Another process of manufacturing and dying morocco, the quantity of materials calculated for* 36 *skins.*

Fold the skins in the middle lengthwise, tie them six in a bundle, and put them in the lime vat; when sufficiently limed, take them out rinse them in clear water, drain them, and hang them in the shade to dry, till the hair will come off. After carefully taking off the hair, put in the lime vat again to remain from fifteen to twenty days; they are then to be rinsed, and passed repeatedly through a decoction prepared of 30 pounds dogs dung, and an equal quantity of water. As soon as the skins are thus gradually impregnated, they are thrown into a large vessel for the space of twelve hours, after which they are cleaned with pure water, and immersed for seven or eight days in a watery decoction made of bran.

The skins are now wrung, and thoroughly washed in clear water, to render them soft and pliable; next they are cured by spreading a thick layer of common sea salt, in the proportion of about half a pound to each skin, and piling them up, till they are rendered sufficiently suple. The last process which the skins undergo, previous to being dyed, is immersion in a liquor prepared by boiling twenty-four ounces of dried figs for each skin, in a copper, (it is believed that treacle molasses would answer the same purpose as figs) in which they remain till they are about to be suspended in the air for drying; lastly, they are dipped in a solution of alum, that disposes them for the dye.

The red colour is prepared by mixing together various articles in the following proportions, which are required for a parcel of 36 skins. Cochineal, 130 drachms; round suchet, (crocus indicus,) 45; gutta gambia, 15; gum arabic, 10; white alum, pulverised, 10; bark of the pomegranate tree, 10; citron juice, 2; common water, clear and good, 120 pounds.

The alum is gradually added to the other articles, which are thrown into a copper, where they should be boiled for about two hours, till one tenth part of the water be consumed. In this mixture the skins are repeatedly immersed, and when sufficiently imbued with the colour, they are dried, and again steeped in a vessel, containing 3 pounds of hot water (for every two skins) together with

one pound of sumach, and the same quantity of gall-nuts, pulverised and sifted. As soon as the skins are completely impregnated with this liquor, they are slightly rubbed over with a sponge dipped in pure water, and suspended three quarters of an hour to drain. They are now carried to a river, or in running water, where they are repeatedly rinsed, then pressed with weights in order to extract the moisture, and hung up in a warm room to dry. The last process which red morocco leather undergoes, is that of polishing; this is affected by various wooden instruments, that contribute at the same time to remove such of the particles of the gall and sumach as may adhere to the skin.

The yellow colour is prepared in a manner nearly similar to that just described; the common avignon or yellow berries (grain de Avignon) being substituted for cochineal and employed in similar proportions.

The only variation between the two processes of dyeing red and yellow, is, that the red is tinged with the colouring matter before it is worked or polished with the wooden instruments; whereas the polishing is done to the skins intended for yellow, previous to dyeing them.

VII. *On the use of acids in bleeching.*

The use of acids, in bleeching of linen has been long known. Formerly milk was chiefly employed; but it had several inconveniences. The quantity requisite could scarcely be obtained, its effects was slow, and containing animal matter, it was apt to spoil the cloth.

It is now known that the fossil acids, when properly diluted with water, answer much better, and do more in a few hours in whitening cloth, than animal acids do in a week, in facilitating the operation. It was at first feared, that mineral acids would corrode, or burn the linen substances. Experience has dispelled these fears, and convinced the bleachers, that by proper management, the danger is next to none.

According to the strength of acids, they must be mixed with water, sometimes to seven hundered times their bulk.

The vitriolic acid is that which has been universally employed; as it could be bought in large quantities, and at a small expence.

The muriatic acid being now sold nearly as cheap as the vitriolic, and answering in a superior degree, will, no doubt, be generally used.

VIII. *An excellent dye, the basis of many colours.*

A decoction of the seeds of red Trefoil is mixed with

different mineral substances; the dyes produced are very beautiful, and of a great variety. Among these are yellow and green of different shades, as also citron and orange colours.

These dyes arewell adapted to woollen andcotton manufactures; they resist the action of the substances, with which trials are usually made, much better than the common dyes; and promise many advantages, if adopted, to the manufactures of this country.

IX. *Discovery for dyeing cotton and linen, in scarlet, crimson, and other colours.*

Cotton or linen, either in yarn or in the piece, should be perfectly wet with hot water, and then wrung out, as is the common practice. This being done, it must be perfectly soaked in a solution of tin, diluted with an equal quantity of clear soft water. The cotton or linen being so far prepared, must be wrung out, but not forcibly; then it is to be nearly dried, lying horizontally upon a hurdle, with a double linen sheet between, and covered with the same. The solution of tin being for scarlet, must be made of nitrous acid, and not of aquafortis. But for crimson, aquafortis must be used, and the bloom is to be given, after it comes out of the dye, by a small quantity of sal ammoniac and pearl-ashes dissolved perfectly in warm water, but this water must not be more than milk warm. The colouring vat, for the scarlet or crimson, is simply cochineal in water, no hotter than the hand can bear; and as vegetable matter receives only the small particles of the colour from the nature of its pores, two ounces to a pound of the materials dyed, may be necessary. But cotton or linen, fresh prepared, will draw from the same vat, heated as before, all the inferior shades from scarlet and crimson, and, if any colour still remains in the vat, it may be taken out entirely, by wool prepared in the usual manner. The same preparation of tin serves for the green, and yellow, with the same materials only as are used by the dyers, except the best yellow, which is produced from turmeric.

It is necessary to observe, that after the preparation of tin has been used for scarlet or crimson, the residue continues sufficiently strong for green and yellow, even after it has been kept for a considerable time.

N. B To make the best solution of tin with nitrous acid, it is necessary to have the strong smoaking spirit, to which an equal quantity of the purest river water must be added, and the proportions of the following ingredients are to the weight of spirits; one sixteenth sal ammoniac; one thirty-second refined nitre, dissolved by a little at a time, in this aquanegia. Dissolve also, one eighth of granulated

grain tin, by small quantities, to prevent too great an ebullition, which would weaken the solution considerably.

The ingredients and proportions are the same, when a solution is to be made with aquafortis ; but that spirit, in general will not bear any water, when a perfect solution is intended.

X. *Simple method of trying the quality of gun powder.*

Put upon dry white paper a thimble full of powder ; lightly touch it with a burning coal. If it be excellent, every grain will instantly rise in smoke, only leaving on the paper a round spot, pearl colour. If bad, it burns the paper. The mean effects between these two extremes will exactly show the quality. The powder burning the paper a little, is better than that which burns it much ; only blackens it, it is better than if it burns it.

By this trial, the defects in its composition may also be discovered. If it blacken the paper, it contains too great a proportion of coal ; does it leave yellow spots, too much sulphur ; if their remain on the paper small grains like pin heads, and they should burn by applying fire, it is nitre, and the powder has not been well pulverized. If these do not burn, the nitre has not been properly refined.

XI. *On dressing sheep skins.*

Tanned sheep skins, at this day, are in great demand for a variety of uses ; but for want of proper attention in taking off the wool, the skin is sometimes so far injured as scarcely to be worth dressing. The following method will be found beneficial. As soon as the skin is taken off the sheep, spread it on a horse or cow, and in six or eight hours the wool will come off better than any other way. After the wool is off, spread the skin on a pole, and let it hang in the shade (as the sun is very detrimental to it) till convenient to send it to a tanner.—This practice will render sheep skins of four times the value they now are, and save thousands of pounds to the country.

XII. *To prevent worms injuring books.*

During the months of July, August and September, but most in August, there is a very small insect that deposits its eggs in books, especially on those leaves nearest the cover. These gradually produce a sort of mites, similar to what are produced in cheese, which afterwards change their state, and become beetles. When the time of their transfor-

mation approaches they eattheir way through till they gain the extremity of the book. To guard against their attacks, it is recommended to use mineral salts, to which most insects have a great aversion. A composite salt of alum and vitriol, are proper for this purpose, a small quantity of which may be used with the paste made use of by bookbinders. It is also advised that book-binders make their paste of starch instead of flour. A little pulverised alum, should also be strewed between the book and its cover and also on the shelves were books are kept.

XIII. *Another method, by paste made of chesnurs.*

For this paste see Art. xliii. Chap. xviii. on the culture of the chesnut tree.

XIV. *A preparation for the hair.*

Take of olive oil and spirit of rosemary, equal parts; add to these a little oil of nutmeg. Rub the hair every night with a little of this liniment, increasing the proportion gradually, and every purpose of the most boasted preparation will be answered.

XV. *On making hair powder.*

Hair powder is generally prepared from starch made of flour, which, after being thoroughly dried, is ground and passed through the finest sieves If pure, it should be perfectly white, and possess no smell. It is frequently scented with the essences of jessamine, violets, roses, &c.

XVI. *To make London Court Plaster.*

Dissolve the best isinglass (previously cut in small pieces) in any proof spirit, so as to obtain a strong viscid solution; then take taffety, or other thin silk, and spread the liquor uniformly over it, with a soft brush; when the first coat is perfectly dry, repeat the application a second and third time, till at length the whole surface sould be sparingly anointed with Peruvian balsam.

XVII. *Chinese method of making cloth, &c. water-proof.*

Dissolve white wax in spirits of turpentine, in the proportion of one ounce of wax to one quart of spirits of turpentine. Let the cloth be dipped in this solution, and then be suspended in the air till it be perfectly dry. By this method, the most open muslin, as well as the strongest

cloths, may be rendered impenetrable to the heaviest showers; nor will such composition fill up the intercices of the finest lawn, or in the least degree affect the most brilliant colours.

XVIII. *To make verdigrease.*

The best verdigrease is mostly manufactured at Montpelier, in France, by forming alternate strata of copper plates, and the husks, of grapes, during ther vinous fermentation; when they speedily become acid, and corrode the copper. After the plates have stood in such situation for a sufficient time, they are moistened with water, and exposed to the air, the verdigrease being successively scraped off as it collects on the surface In this state the verdigrease, or acetite, is called fresh, or moist verdigrease, having the form of paste; which after triturating it in proper troughs, is put in bags and dried in the sun.

Verdigrease, is chiefly consumed for striking a black colour, when combined with a decoction of logwood; but, as it is apt to corrode the texture of the cloth, a substitute has been discovered for it, in dying black. Dissolve separately equal parts by weight of vitriol of copper, and potash, or other strong alkaline salt: the solutions are then to be gradually mixed, and if the vitriol be saturated the water on the surface will become transparent on adding a few drops of the alkaline solution; in the contrary case, a blue colour will be produced, so that more ashes should be added, till a complete saturation be effected.—These proportions of vitriol and alkaline salt, will be equivalent to a similar quantity of verdigrease, and on being combined with decoctions of logwood, they impart a fine black dye, which is not injurious to the texture of cloth, hats, or any other article that may be tinged of such colour.

XIX. *To make vitriol.*

Vitriol is a compound salt, formed by a combination of zinc, copper, or iron, with the sulphuric, or vitriolic acid; and which is either white, blue, or green according to the metal employed.

White vitriol is generally prepared by mixing 5 parts of sulphuric acid with 20 parts of distilled water, and gradually adding 3 parts of zinc, when the ebullition ceases, the liquor is strained, and after being evaporated, it is deposited in a cool place, where it shoots into white christals.

Green vitriol consists of sulphuric acid diluted with ten or twelve times its weight of water, in which iron filings

are dissolved; when the effervescence ceases, the mixture is for some time placed in a sand bath; next, the liquor is strained through paper; and, after being evaporated, it shoots into rhomboidal christals, which are also termed salt of steel.

Blue vitriol is made by stratifying plates of copper with sulphur; and, on slow combustion, the sulphuric acid corrodes the copper; the metal is then boiled in water, till the saline particles are dissolved; when after repeated solution, and subsequent evaporation, the whole is reduced to the christalizing point.

XX. *To make aquafortis.*

Distil equal parts of calcined vitriol, and crude nitre; or mix one part of oil of vitriol with nine of pure spirit of nitre.

XXI. *To make German black.*

Take of the lees of wine, and ivory, bone, or peach stones; let these be burnt and afterwards ground to a fine powder. The lees of wine should be washed previous to burning, and of the other materials, the ivory is best. This black is used principally in rolling-press or copper-plate printing.

XXII. *To make ivory black.*

Ivory black in made by burning ivory till it is quite black; this is usually done between two crucibles well luted together. It may be used either as an oil or a water colour.

XXIII. *To make bone black.*

Bone black is prepared from bones burnt in the same manner as to make ivory black. It is used by painters, &c.

XXIV. *To make Spanish black.*

Spanish black is burnt cork. Used also by painters.

XXV. *To make lamp black.*

Lamp black is the sooty smoak of rosin. The first black called by this name was produced from the smoak of lamps of a certain construction, in which various substances were burnt. The kind now used is made of rosin, which is first cut into small pieces, melted and purified in

iron vessels; it is then set fire to under a chimney, or suitable place made for the purpose, the top of which is lined, or covered with sheep skins, or pieces of coarse linen cloth, to receive the vapour or smoke, which is the black.

XXVI. *To make currier's black.*

That kind called the *first black* is made with gall-nuts, sour beer, and old iron. The *second black*, or best kind, is composed of gall-nuts, copperas, and gum-arabic. This is used prior to giving the leather a gloss.

XXVII. *A preparation for sole leather.*

Heat the leather by exposing the flesh side to the fire; then with a brush apply warm tar. Repeat the process of heating the leather and applying the tar, three or four times, according to the thickness of the leather, till the tar has nearly penetrated through the skin. Care must be taken not to make the leather or tar too hot, as that injures it in the wearing.

Various preparations of rosin, pitch, turpentine, tar, oils, &c. are made for the purpose of rendering leather water proof. Some of them answer equally well on upper and on sole leather.

CHAP. XVIII.

ESSAYS ON AGRICULTURE, AND RURAL ECONOMY.

I. *Preparing of the land for Wheat.*

In the winter season, carry on a sufficient quantity of manure; and as soon as the frost is out of the ground, plough it over smooth, furrow it, and plant it with potatoes in hills, leaving just room between the hills to plough both ways. When they are grown to the height of two or three inches, plough them one way, turning the furrow upon the hills on each side, having a person to follow and weed them out.

About the end of June, cross plough them, turning upon the hill again, and let the person following the plough, mould the hills; and about the twentieth of August you will find that the tops die; then pull them, for the longer they remain in the earth the more water they will collect in their substance.

As soon as the potatoes are gathered, turn in your hogs, and let them remain there till the beginning of October.--They will by this time have torn up, and mixed the ground better than any ploughing. Then harrow the ground for sowing wheat.

The advantages are, that the potatoes kill the weeds and turf; and the hogs by rooting and turning the soil, in search of potatoes, effectually destroy all kinds of vermin which have been left in the ground, besides a considerable saving in their keeping.

II. *Preparing of the Seed Wheat.*

Let the wheat be thrice thoroughly washed; and let the water drain from it, after the third washing. Then steep it eighteen hours, in brine strong enough to float an egg, and spread it on a floor, to let the brine run off; but while the wheat is yet moist, let quick lime be equally sifted over it, stirring it very well with a shovel, and continue sifting on more lime, until the wheat be equally dusted with it, in the proportion of half a gallon of lime to a bushel of wheat By stirring it well with a shovel, the wheat will soon be dry and fit for sowing.

The produce of some exceedingly smutty wheat prepared for sowing in the above method, has been good, clean, well filled grain.

III. *On the culture of wheat.*

A more beneficial discovery has not been made in agriculture, than that of clover being an infallible preparative to a crop of wheat. It has seldom been known to fail on poor land, and is particularly advantageous to rich, as the straw will be strong, the ear large, and the number of stems from a root incredible. If ever a marvellous crop of wheat be raised on very rich ground it must be in this way; for rich fallows produce a luxuriant tall straw, weak at the root, with a small ear which will fall.

In proof of the foregoing observations, let reason be attented to; clover grass affords rest to land, and keeps out weeds; the pasture produces feed in abundance for cattle; the dung of the cattle, with the vegetable salts contained in the large top root and heart of the clover afford vivid manure for wheat. One other advantage of this mode of culture, is, that the root of the grain growing in them the water drains from the root, and the surface of the ground will not rise with the frost, as fallows of a fine mould are apt to do—the wheat, therefore, must stand the winter much the best, if sowed upon a clover turf; the method to be adopted is as follows:

In the September of the second summer after your clover was sowed, pasture it close to the ground, and turn your furrows over, very clean and even; but before the the two last furrows of each land is split, take a handful of wheat, and drop along in each furrow, throwing it before you as you step along, and then split the two furrows, turning them on the wheat; if this be not done the sides of the land will be bare, the same day it is ploughed, sow on each acre three pecks of clean seed-wheat, broad-cast; after it is sowed, take a roller and run over the land the same way it is ploughed. When this is done, harrow it over two or three times the same way, until the seed be covered; but by no means harrow across the land, or furrows; make the water furrows (if need be) with the spade, and turn the grass side of the sods downwards.

IV. *On the gathering of wheat.*

When this valuable grain has attained its full plumpness and begins to shew its ripening colour, it should be reaped, and laid a few days with the ears a little elevated to harden, before it is bound up, and afterwards stand a week or ten days in shock, which will be the means of its proving sweeter, weighing heavier, and yielding a much greater proportion of flour, and less bran, than when it is suffered to stand on the ground till the ears become inverted, and the corn parched and shrivelled; but this is far

from being the whole of the evil; for the straw, when cut in a dry and brittle state is not so valuable for thatch, fodder, or litter, as it is, when cut in a greener state, and when a brisk wind happens, there is frequently a loss sustained by one third of the crop.

V. *On preparing seed corn.*

Dissolve saltpetre in water, so as to make it very strong. Soak your seed corn therein, until it becomes swelled; then plant it in the usual way, taking care not to let it be long out of the brine before it is covered. It will produce three times the crop, and will be ripe sooner, than the same sort of corn, planted without soaking, on ground of the same quality.

VI. *Another method.*

Go through your field, when the corn first begins to ripen, mark all such large and fine ears as are turned white, and where there are two on a stalk; when thoroughly ripe, gather them, by pulling off the ear, husk and all, hang them up where no wet will come to them, and let them thoroughly dry. By taking the first corn that ripens, where there are two ears on a stalk, for seed, you will have your crop earlier, by ten days, or a fortnight, the following year, and the quantity considerably encreased.

VII. *Observations on increasing the quantity of Indian Corn by selecting the seed; communicated by Mr. John Shepherd, of Greenwich, Cumberland-County New-Jersey.*

Having heard it suggested, that Indian corn might be improved by a careful attention to plant only such seed as is gathered from those stalks which produce two ears, I collected in the fall of 1786, a sufficient quantity of such ears for to plant my next crop. In the spring of 1787, I planted this seed; and was well pleased to find my crops increased much beyond the quantity I had been accustomed to. In the first year I estimated the encrease at near or quite ten bushels per acre, and by following the same rule in saving my seed, for three years, my crops have encreased to sixty bushels per acre, and I have now three and four ears upon a stalk.

VIII. *On the advantages of steeping seed Barley.*

The advantages of steeping seed barley is made known in a communication from Mr. James Chapple to the Bath Society, he observes.

The last spring being remarkably dry, I soaked my Barley in the black water taken from a reservoir which constantly receives the draining from my dung heap and stables. As the light corn floated on the top, I skimmed it off, and let the rest stand twenty four hours. On taking it from the water, I mixed the seed grain with a sufficient quantity of sifted woodashes to make it spread regularly, and sowed three fields with it. I began the sixteenth, and finished the twenty-third of April. The produce was sixty bushels per acre, of good clean barley, without any small or green corn. No person in this country had better grain.

I sowed also several other fields with the same seed, dry and without any preparation; but the crop, like those of my neighbours, was very poor, not more than twenty bushels per acre, and much mixed with green corn, and weeds, when harvested. I also sowed some of the seed, dry, on one ridge in each of my former fields; but the produce was very poor, in comparison with the other part of the field.

IX. *On the advantage of preparing seed Oats with plaister of Paris---in a letter from E. Hand, to S. Powell, Esq.*

Late in the month of April, having a piece of ground in the vicinity of the borough of Lancaster, prepared to be sown with oats, which I suppose would take sixteen bushels of seed; the evening before it was sown, I had eight bushels put into a trough and covered with water. The next morning, the water was drawn off, and the oats laid in a heap to drain for half an hour, then plaister of Paris, in powder, was thrown on, by small quantities at a time, and mixed with the oats, till they acquired a sufficient degree of dryness, to be evenly sown. In the process, one bushel of plaister was consumed. The seed thus prepared, and dry seed from the same original heap, were sown on alternate lands throughout the field. The whole came up together, and in due time, and no difference was visible for seven or eight days. From that time forward, the distinction became very evident, the oats on the lands sown with the prepared seed, were much more luxuriant, and of a deeper green, until they began to ripen. On the second of August, they were cut, being then perfectly ripe, while those on the lands sown with the unprepared seed, were yet green, the heads much smaller, and promissing in every respect a worse crop.

The produce of the eight bushels of prepared seed was one hundred and twenty two bushels and a peck; of the eight bushels of unprepared seed, ninety-six bushels;

the former yielding an increase of fifteen and a quarter for one, or thirty and a half bushels to the acre; the latter only twelve for one, or twenty four bushels to the acre. The produce of the prepared seed weighed thirty three and a half pound per bushel; that of the unprepared, only thirty two and a quarter pounds. Thus for the expence of one bushel of plaister I have gained twenty six-bushels of oats, and in the extra weight, equal to four and a half bushels more.

X. *On the culture of Oats.*

Of oats there are ten species that are known in England, the names of which are, the naked oat, or pilcorn. The tall oat. The bearded or wild oat. The rough, downy or hairy oat. The yellow oat. The meadow or yellow leaved oat. The common oat. The skegs oat. The Tartarian or reed oat And the Frieseland and Poland oats, of which that called the sativa, or common oats is most generally cultivated.

This species thrives on almost any soil; and being extremely productive on land newly broken up, it is eminently adapted to most parts of the United States. It is divided into three varieties, namely—

1. The white oats, which are the most valuable, and require a soil somewhat drier than that for the other species; this variety is chiefly cultivated in the southern counties of Britain.

2. The black oats, which are principally raised in Scotland and the northern counties of England. For feeding cattle they are of equal quality with the white oats, though not affording so sweet a meal for culinary purposes as the white oats.

3. The brown or red oats, produces good meal; ripens somewhat earlier than either of the two preceding varieties, and does not shed its seed. It is chiefly cultivated in the northwestern parts of England, for the feeding.

All these varieties are propagated by seed which may be sown from the first of April, till the middle of May in the proportion of from three to six bushels per acre, broad cast. It is some-times sown with grass seeds, such as clover, ray grass, &c. The management of this kind of grain, does not materially differ from that of barley, rye, &c. Oats have in some instances, been both dibbled, and drilled; but as this method has been attempted but by few, how it may answer has not been fully ascertained; there is but little doubt, however, but that either method, if properly conducted, would be preferable to the broad cast sowing.

The last mentioned species or that called the Sativa or

common oats is raised on account of its farinaceous properties. The grain is given to horses, for which it affords a very strengthening food ; and, before barley came into general cultivation, it was converted into malt.

The meal is made into cakes, biscuit, &c. or boiled into a kind of pottage. Its straw is also, usefully employed in feeding cattle, when mixed with potatoes.

XI. *On the culture of Potatoes.*

Potatoes require a rich loam not too moist. Wet land produces too much top, and watry fruit, strong to the taste, and not good to keep through the winter. Very dry land produces a small crop, and knotty fruit. Land that is apt to brake should also be avoided.

For this crop, the earth should be well ploughed and kept clear of weeds, and should not be shaded. The principle error, however, in cultivating potatoes, is too much hilling : if planted in a suitable soil, they will always bed themselves at that depth most suitable to their growth, which is about four inches. If you are necessiated to plant them upon a hard bottom a little hilling may be useful. It has no doubt, been observed by most people who cultivate potatoes, that if the tops are partly covered with earth, small potatoes will grow upon them, this hinders the growth of the first crop. We conclude with a short remark relative to the time of gathering this crop.

Every production of the earth has its maturity. The sign of ripeness in this fruit, is the fading of the leaf and shrinking of the stalk. If gathered before they are ripe they will be unpleasant to the taste, and not keep so well as if suffered to grow longer.

XII. *To encrease your variety of Potatoes, and obtain excellent kinds.*

Take of the balls when ripe in Autumn, open them and dry the seed in the sun, so that they may be preserved through the winter ; plant these in good mellow ground in the spring, and keep them clear of weeds &c. The first years produce will be small, take of the largest of these, and the best kinds, to plant the following year, and your potatoes will be much improved.

XIII. *To preserve Turnips from insects.*

1. To each quart of turnip-seed, add one ounce of brimstone finely powdered, put both into a bottle, large enough to afford room to shake them well together every day, for four or five days, previous to sowing, keeping the bottle well corked.

2. Take such a quantity of elder leaves, as when bruis-

ed, will yield juice, sufficient to cover the turnip-seed you intend to sow, in which let it soak about twelve hours; the next day mix it with the bruised leaves, and sow all together.

Turnip-seed is generally covered with a brush harrow; take elder bushes for this purpose; if the berries are on, the effect will be encreased. If notwithstanding these precautions the fly should attack the young plant, draw elder bushes gently over them.

Turnips sowed upon ground where a crop of flax has been taken off, are not so likely to be injured by the fly; it is also, well to sow turnip while it rains, they do not require to be harrowed in, and grow so rapidly, as soon to get beyond the power of the fly.

XIV. *On the culture of Turnips. Another method.*

Turnips for fall and winter use, are generally sown the last of July. I have been long apprehensive that this sowing is too early. The weather at this season of the year, is generally very hot, and very dry; and droughts has a direct tendency to dwarf and spoil a field of young turnips; the black fly also, a natural enemy of the turnip, is at this period very voracious, and the crop is too often destroyed, or rendered unprofitable from one or other of these causes.

With a view to remedy these evils, I sowed my turnips, the last year, very late in August. My neighbours laughed at me, and said I should not have a single mess; I had however, more and better turnips than any of them. Encouraged by this success, I sowed this year on the 25th of August, a small piece of ground, eight rods only with turnips. They came up well and not a fly touched them. When they had four or five leaves I directed one of my men to weed, and thin them, so as to have them and stand ten or twelve inches a part. The ground was afterwards slightly stirred with a garden hoe. the leaves grew rapidly—covered the ground—and prevented the further growth of weeds. On the 11th November, I pulled the turnips, trimmed and measured them, and had on the eight rods of ground (the twentieth part of an only acre) forty-five bushels of as large and well flavoured turnips as I ever saw. This produce is at the rate of nine hundred bushels per acre. The soil is a sandy loam, in good heart, but by no means in high tilth.

I sowed two other small pieces of ground, the one on the first, the other on the eighth of September. Neither of these yielded like one sowed on the twenty-fifth of August; but each of them produced much larger, and better turnips, than any I have seen, that were sowed at the usual time.

I attribute my success altogether to the late sowing; the heat is then less intense—the rain more frequent—the dews copious—the fly harmless and the crop abundant.

XV. *On the culture of Carrots.*

It is not long since carrots were first raised in Europe, for the use of cattle. Since the introduction, however, of this culture, it has rapidly spread, and is now universally attended to by the graziers there

In rich, loamy and deep soils the product of this valuable root has been known to be four and even five hundred bushels per acre; this however, only were great attention was paid to them. We must not estimate them at this rate in field cultivation, where the labour and expence are comparatively small. In common fields, however, with a common proportion of manure and labour, taking the diversity of soils, and difference of seasons the average produce of an acre would be two hundred bushels. No kind of husbandry can be practised that will keep so many cattle upon a given quantity of land, and at so little expence. Cattle of all kinds are exceedingly fond of them, and prefer them to the best hay. Swine will eat them greedily, and fatten upon them. They increase the milk of cows; and even horses keep in as good condition upon them, as upon grain.

For their cultivation a rich, loamy and deep soil, rather dry, than wet, should be chosen. Let this be well ploughed, and cross-ploughed, and made level with a harrow, then in trenches drawn about two feet apart, the seed is to be sown. They will require one or two ploughings and hoeing in the months of June and July and about the first of August. From ten to twelve hundred cabage plants for each acre, may be transplanted between the rows of carrots; the necessary hoeing for these will keep the carrots in good order until it is time to gather the whole.

XVI. *European method of cultivating Hops.*

Hop plantations should always be upon new land, if you want to plant in the spring, your ground should be prepared in the preceding autumn, by being well ploughed, and laid even.

Some plant hops in March and April, but the most experienced prefer October, which season, however we, would observe, is not so proper in America, as in Europe; most trees, plants, &c. that require transplanting, do better, if moved in the spring, than if moved in the fall, in the United States. The ground being prepared, let the hills be marked out, they should be about eight feet apart each way, the holes for planting them should be from eight to ten inches deep, and a foot square. The largest plants are to be chosen, they should be about nine inches long, and have three or four joints or buds to each; set one in each corner, of the holes, and if planted in October, cover

them an inch over the top, but if planted in the spring, when they have shot from the joints, they must not be buried; after this the ground must be carefully kept clear of weeds.

Dressing.

This is preparing the ground, in the autumn, winter, and spring for making a good summer crop. In doing this, the hills upon which the plant stand, must be all pulled down, and undermined on every side, till the spade (or hoe) comes near the principal root; then shake off, or remove with the hand, the loose mould from the upper or loose roots, that you may see where the new roots grow out of the old sets. The old sets are to be carefully preserved, but the other roots may be cast away. Whatever may be the time that the hills are pulled down, the roots must not be cut till March When your hops are dressed for the first time after planting, all the roots are to be cut away that grew the year before, and the sets are to be cut off within one inch of the old setting; and every year after, they must be cut as close as may be to the old roots, or settings. Observe, however, that those roots which grow downwards are not to be injured, those only, which run horizontally are to be cut. The old roots and the young ones may be easily distinguished, as the old ones are always red, and the young ones white. Wild hops, should by no means be permitted to grow in your field; if any get there, mark the hill, when gathering your hops, destroy such hills when dressing the ground, and replant it. When you cut and dress your hop field in the spring, your land should be manured with the richest composition you can make. The hills when first made should not be too high, lest they hinder the young shoots; at the second hilling they may be finished. Two or more ploughings is required during the months of May and June, which completes their dressing.

Gathering and drying.

Hops blow in July, bell in August, and are ripe by the first of September. When they begin to change colour, they are easily pulled to pieces, and their seeds look brown within them, they are ripe, and are then to be gathered as soon as possible. If the weather be fine, the vines may be cut and the poles left standing, for one, or two days, in which time the hops will be nearly dried; it is, however, preferable to dry them in the shade, or not exposed to the sun, and dew; they should, therefore, be picked off, and spread thin upon floors, and be frequently

moved and stirred about, that they may quickly, and evenly dry. In the damp and humid atmosphere of England, it is almost always necessary to dry them in kilns, this may be dispensed with in America, if the season is any way favourable: however, care should be taken to dry the hops as fast as they are picked; for in, lying undried, they are apt to heat, and change colour, very quickly. The drying of hops is, certainly, one of the most material part of their manufacture, for, if they be ill dried, they loose all their agreeable flavour.

Bagging them.

The last thing done to hops is putting them up in bags of coarse cloth for carriage. When hops have been picked and dried on the cast, or tin floor, they are so brittle that they would break to pieces, and be spoiled, if they were immediately to be put up; they are therefore to lie together for about three weeks, till they become tough, or if covered from the air, with blankets, in a heap, they may be bagged sooner. The manner of bagging them is as follows: A hole is made through an upper floor, so large, as that a man can conveniently go up and down in it; then a hoop is fitted to the mouth of the bag, and so firmly sewed on, that it cannot be torn off, the bag is then let down through the hole; the hoop remaining above prevents the bag from being quite pulled through, as the hoop is larger than the hole. A few hops are first thrown into the bag, and taken up into each corner, and tied, making a sort of tassel, or handle by which the bag is easier handled. When this is done, one man must go down into the bag, and, while another cast in the hops, he must tread them down equally every way with his feet; and when the bag is in this manner filled, it is ripped from the hoop, and sewed up, leaving two tassels at the corners of the top, same as at the bottom. A bag of hops so prepared, may be kept for several years.

XVII. *On the culture of flax.*

A skilful flax-raiser always prefers a free, open, deep loam, and grounds that produced the preceding year a good crop of turnips, cabbage, potatoes, barley, or broad clover; or has been formerly laid down rich, and kept for some years in pasture.

A clay soil, manured with ashes, will answer well for flax, as well as soils of a lighter quality; provided it be brought to a proper mould, by being tilled after harvest, to expose it to the winter frost; and by repeated, ploughing, in the spring, to make the ground fine. A little old

stable dung, or that of pigeons or sheep, may be spread upon the ground immediately before sowing.

Ground enriched with shell, or other marls, will answer well for flax, if the marl has been mixed with the soil for some time.

In dry soils, the broader and more level the ridges are laid the better; as, by that means, the natural moisture will be longer retained, and the crop rendered more equal and uniform; a great advantage to crops of flax.

All new grounds, or such as have lain long in grass or pasture, produce clear crops of strong flax; but ought to be ploughed shallow, and the furrow laid flat. After ploughing, a heavy roller should be used, to press the sod smooth, and close to the ground. This will make the grass rot the sooner.

Flax seed ought never to be sown on grounds either too wet or dry, but on such as retain a natural moisture; such grounds as are inclined to weeds, ought to be avoided, unless prepared by a careful summer fallow, or by crops of turnips, cabbage, or potatoes.

Before sowing, the bulky clods should be broken and stones, &c. that will hinder the growth of flax, be removed.

Choice of seed.

The brighter in colour, and heavier the seed is, the better; that which appears, when bruised, of a light or yellowish green and fresh in the heart, oily, and sweet to the taste and smell, may be depended upon. Seed should be repeatedly passed through screen, that there may not be left in it any vine seed, or light defective flax-seed.

Of sowing lin-seed.

The quantity of linseed sown, should be proportioned to the condition of the soil; for if the ground be in good condition and the seed be sown thick, the crop will be in danger of falling, before it is ready for pulling. On the generality of soils, about two bushels of seed is required to an acre; the time for sowing is from the middle of March to the end of April, as the ground and season answer.

It ought always to be sown on a dry bed, and if the soil be light, it should be rolled; especially if grass seeds are sown along with it. If sown on grass ground, ploughed shallow, it cannot be harrowed, even length-ways, a harrow would tear up the sods. A heavy brush is best.

Of weeding flax.

If the seed is clean, and sowed on grass ground, all the trouble and expence of weeding may be avoided; should it however be necessary, it ought to be done, when the

flax is about four inches high; if longer, deferred, the weeders will so much break and crook the stalks, that they will never, perhaps, recover their straitness again, and flax that grows crooked is very liable to be injured in the rippling and swingling.

If there is an appearance of a settled drowth, weeding should be omitted it is then injurious.

Weeds when pulled, should be carried off the field, if left, they often take root again and obstruct the growth of the flax.

As young and unskilful persons, frequently pull up and spoil the flax, while weeding, they should not weed alone, but with experienced persons and all care should be taken, not to tread down and injure the flax.

Of pulling flax.

If it is intended to save both the flax and the seed, the pulling should not begin till the stalk becomes yellow, almost all the leaves are fallen, and the balls turned so sharp that they will stick to the finger, when pressed upon their points; also one of the lower balls, cut across the grain, appears full of seed well formed, and firm. But if the stalk is small, with few balls upon it, which is a sign that the flax is fine, it ought to be pulled when the stalk first begins to grow yellow, when only the undermost leaves fall, before the bloom is quite over, before the balls turns sharp pointed, and when one of the balls, cut across the seed appears soft and watry. It is a rule with persons of skill, to follow this last method, when they think that about eight hanks or more, may be spun from a pound.

When flax has fallen, such as lies ought to be immediately pulled, otherwise it will rot; and that being pulled, the rest of the crop will receive the more air, and be less apt to fall.

When parts of the same field grow unequally, so that some is ready for pulling before other, that which is ready should be pulled, and the rest be suffered to stand till fit.

The flax raiser ought to be at great pains to pull, and keep by itself, each different kind of lint; what is long and fine, by itself; long and coarse, by itself; short and fine, by itself; and short and coarse, by itself; and, in like manner, every other kind by itself, for if the different kinds are not thus kept seperate, the flax will be much damaged in the watering, and other succeeding operations.

While pulling and sorting the flax, the weeds ought to be picked out, otherwise they will hurt the flax in the operations of watering and dressing; and what is commonly called under-growth, may be thrown away as useless.

Few persons that have seen flax, pulled are ignorant of

the method of laying it in handsfull across each other, upon bands composed of some of the stalks. Laying handsfull in this way, admit fresh air, and keep them separate, and ready for the rippler.

Process after pulling the flax, and before rippling it.

If the flax is not of the finest kind, the cross handsfull, after lying twenty-four hours, as above described, should be turned upon the band ; and, after lying other twenty-four hours, should be bound up in sheaves, and stacked. If the weather is dry, in about a fortnight's time, it will be ready for rippling, and may be removed to the barn. But if the flax is fine, it should be put into stacks, in about twelve hours after it is pulled, and in two or three days it may be rippled.

Keeping the flax unwatered till the next spring, is attended with many bad consequences. For, when too much dryed by long keeping, it is not so easily, nor so safely watered, the quality of the flax is harsher and coarser; it is subject to danger from vermin, and other accidents, during the winter; the water in the spring, or beginning of summer, is not so soft and warm, as in harvest, and near a year is lost, of the use of the lint, by the practice of keeping it over the winter.

Of rippling flax.

The seed ought by all means to be seperated from the flax before watering, for if put into the water along with the flax, it is apt to breed vermin, and discolour the flax. The seed is also worth saving as feed for horses and cattle, when not ripe enough for sowing.

When the seed is ripe enough for sowing and intended to be saved for that use, it should be rippled within doors, for rain and damp will discolour it, and render it unfit for sowing.

The handsfull for rippling should not be large, as that endangers the lint in going through the comb. After rippling, the flax raiser will see that he is able to assort each size and quality of the flax more exactly than he could do before.

Of winnowing the seed.

The balls, after rippling, should be well threshed with flails, or in some other way broken, and then passed through a riddle to take out the ends of the flax, that have broken off in rippling. After this the whole should pass through tanners, and different sieves, to clear the seed as much as possible from broken husk's, dust, week seed, &c. Being thus cleaned, it should be carried to a free-aired

loft, and spread thin, and often turned for some time, to prevent it from heating; and as the seed dries, it may be laid up thicker, and seldomer turned, till at last it is fit for the market or for sowing.

Management of the flax, after rippling, and before watering.

Rushes should be pulled, and dried during the summer, for tying the handsfull of flax for the water. They save flax; they do not so easily rot in the water, and may be dried for next year.

The flax from the rippling comb, being properly assorted, as before mentioned, should be put up in bundles, not larger than a man can grasp with both his hands, and tied slack with rushes. Should the flax be in the least bent, or crooked, by having stood in the field, it must be carefully straightened with ones hands and knees, and laid even together in a mow, in a shade or barn. The mow ought to be raised regularly one row upon another, and be pressed down with logs or boards, and a sufficient weight above them. In this situation it should remain from twelve to twenty four hours, according as the flax is dry or damp. This laying, and compressing of the flax together, mellows it also, and prepares it the better for watering.

Of watering flax.

Running streams, and large lakes are not suitable for watering flax, they waste the lint, and sometimes carry the flax away; canals are most suitable. They should, if possible, be dug in clay ground, as that ground retains the water best: but if a firm retentive soil cannot be found, the bottom and sides of the canal may be lined with clay, or instead of lining the sides with clay, a ditch may be dug on each side of the canal, and filled with clay, which will prevent extraneous water from entering, and the water within from running off.

A canal sixty feet long, seven feet broad, and three feet deep, will generally water the growth of an acre of flax. It ought, if possible, to be filled with fresh soft water from a river or brook, and exposed to the sun, a sufficient time to give it the necessary warmth, which is known by small plants rising and numbers of insects generating in it, and bubbles of air rising on the surface. Should no such signs appear, the water must not be warm enough, or is otherwise unfit for flax.

Water from coal, or iron, is very bad for flax. A little of the powder of galls thrown into a glass of water, will immediately discover if it comes from iron, by turning it

a dark colour, more or less tinged, in proportion to the quantity of that mineral it contains.

The canal ought not to be under any shade; as this besides preventing the sun from softening the water would make part of the canal cooler than other parts, and by that means water the flax unequally.

The sooner flax is watered in the same season, in which it is pulled, the better; in the middle states, however the water will be warm enough to rot flax, or hemp, until October.

The small bundles, or sheaves of flax, before described, should be laid into the canal, in rows across it; the first row with the tops leaning upon the end of the canal, about a foot from the bottom, and the root ends sloping downwards; the top ends of the second row, overlapping the bands of the first row; and so on till the canal be filled. The top ends require the warmest water, and are, therefore to be put uppermost.

The whole of the flax in the canal should be kept under water; this may be done with poles and weights; it should not however, be pressed down so hard as to prevent the water from freely penetrating through all the flax.

The flax, while in the water, should be carefully covered from the sun; it will otherwise be much discoloured.

Soft water, in warm weather will rot flax in four days; sometimes it will require, six, eight, or ten days; therefore some other rule is required to know when it is sufficiently rotted. It is observed that flax, while rotting in a canal, undergoes a fermentation, that while fermenting, it continues to float, or bear up under the weights, and that when the fermentation is over, it will sink to the bottom, and should then be drawn out, and spread on the ground; but previous to taking it out, it should be washed clean, in the manner hereafter to be described.

Great care should be taken that no part is overdone; the coarsest is soonest done; if different kinds be put in together, one kind will be watered, before the rest is sufficiently rotted.

The same water, should not by any means, have two rottings of flax put into it, indeed, could the water be changed several times for each rotting, it would be an advantage, provided the fresh supply of water was let upon the flax quite warm, the lint would be of a better colour, and require less bleeching, when made into cloth.

From the preceding description of the canal, and the manner of rotting flax in it, it will be seen that an extra canal, or a pond above will be of immense advantage. The shape and size of the canal, or pond above, is immaterial, provided it is sufficiently large to contain water

enough to fill the lower canal, and open to the sun, that the water may be warmed. From this canal the lower one can be filled as often as it is thought necessery to change the water. Immediately before taking the flax out, clean water should be let in, and as the small bundles of flax are taken up, they should be gently rinced, and as the lint is then tender, and the bundles slackly tied, it cannot be too carefully handled. When letting water into your canal, it should not run in a swift stream, directly upon any part of the flax; it would injure that that it run upon, especially if nearly rotted.

When changing the water upon flax, that which is let in, should be at least as warm as that which is let out, otherwise it is apt to stop the fermentation, and is attended with other bad consequences.

As many successive rottings of flax can be watered in the same season, in one canal; those who raise only from five to ten acres of flax will not need a canal more than a third or a quarter of the size above mentioned, and could the sides and bottom of it be lined with strips of boards, or lath, so as to prevent the flax touching the ground, it would be still cleaner, and would rot more evenly. The expence of lining a small canal would be but trifling in any part of the United States.

A canal once well made, with last for many years, and certainly is to be preferred to rotting flax on the grass.

On the margin of your pond, or canal, should be placed an inclining platform, or table made of smooth boards, on which to lay your flax when taken out of the water.

Of drying Flax after watering.

When your flax is taken out of the water, and has drained sufficiently, it must be immediately spread open to the sun and wind to dry. Some prefer to slip the bands up to the top of the bundles, and opening the root end of the bundles as much as possible, set them up against fences, or poles fixed up for the purpose. Others choose to spread it out upon a smooth meadow or pasture, where the grass is short, provided there is a prospect of drying weather. In fact, the mode of drying it must be determined, more by the prospect of the weather, than any other circumstance. The flax being sufficiently rotted, should not be exposed to rain or dew, if it can possibly be avoided. If taken out in the morning of some hot and drying days, and properly opened, it would be nearly or quite dry enough by evening to put up.

XVIII. *Further remarks on the culture of Flax.*

To insure a good crop, the seed should be changed every two or three years; indeed, could it be changed every year it would be better. How far it might improve the flax of the United States to bring seed from Europe, has not, perhaps been sufficiently tried, but should this be thought too inconvenient or be attended with too much expence, let them exchange with different states from fifty to five hundred miles apart.

Unless the drill method of sowing is adopted, flax should be sown after sunset, on land well prepared, and harrowed in early the next morning, before the sun rises. Thus the seed is moistened with the night's dew, and is easily enveloped with earth, which renders it invisible to birds, who would otherwise commit great depredations upon it.

Flax requires more care, and nicer culture than any crop we are concerned in. It should never be sown on a soil that is not rich and well wrought. Being a plant that does not require much heat, it answers well in cold latitudes. The cooler kinds of soil, such as clay and loam, and the black earth of drained lands are suitable for it, if they are well pulverized and manured. In wet seasons it commonly does better than in dry ones; so that though it may sometimes do well upon high land, it is best not to risk it, rather choose a soil that is naturally low and moist. If it is too wet it may be drained by trenches, thirty or forty feet asunder. Land should be in good heart either naturally, or made so by manures. It should not, however, be manured at the time of sowing, nor should any thing be done that will make the weeds increase; in no crop are weeds more pernicious than flax. Many of the plants are killed, others are bushy and mishapen, and the coat light, being too much deprived of the rays of the sun.

A green sward ploughed up, well dunged with such manures as are suitable to flax, and planted with potatoes is a good preparation for this crop. This does not abate the strength of the soil, but rather increases. It makes the ground mellow, and destroys weeds. The ground is, therefore in fine order for flax the following year.

A light frost happening after flax is up will not kill it. That which is sown early, grows slowest, and has the strongest coat; early sowing is therefore recommended.

Flax is a very exhausting crop to land; when it is pulled, therefore, the ground should be ploughed without delay and turnips or buckwheat be sowed upon it, to plough under, which if the flax was sowed upon a sward, is an excellent preparative to wheat. Turnips or Buckwheat if they grow well will be equal to twenty loads of manure.

per acre, and the previous preparation of the land for flax the ploughing of it in the summer, and again when you sow your wheat, brings it into good order for your winter grain. This arrangement, however, can only take place, where the soil is naturally suitable for wheat.

It is of the greatest importance to render the lint fine, soft, and equal to silk in spinning. This object is in a great measure attained by boiling it (previous to spinning) for several hours in sea water, to which is added ley made of unslacked lime and two or three parts of pot ash : thus is the coarsest part of flax or tow considerably changed in its texture, so as to resemble the finest lint.

There are various other methods of softening the lint, such as making it damp, and rolling it between iron rollers fixed for the purpose, beating while damp, drying it and combing or hatcheling it through fine hatchels ; and repeating the operation again, and again, rolling or beating and hatcheling it, using still finer hatchels, till the lint is brought to the requisite degree of fineness. In these operations very little of it is wasted, as the tow is always useful for various purposes.

We cannot close our remarks upon this useful plant, without observing, that so great is its value, that not even the chaff from the seed, the shivs, or tow from the first hatchel, should be suffered to be lost. If useful for nothing else, they make a most valuable manure it piled in heaps. or put into compost beds But if burned, they produce nothing Even that which is left upon the ground where it grew, if ploughed under does benefit ; the ground where it is spread to rot is much enriched by the wash of it, or the water of ponds where it may have rotted, if sprinkled upon the ground would do much good.

XIX *On the culture of Hemp.*

The raising of hemp in the United States, is a matter of such consequence, as to demand the attention of every one who has the real interest of his country at heart.

The usual height of this plant when grown is from five to six feet, but this varies considerably, according to the attention paid to its cultivation, and the nature of the soil. It may be cultivated upon ground of every kind ; the poorer land producing less in quantity, though of a finer quality ; as it does not exhaust the soil like flax, it is probable that if care was taken in its cultivation it might almost entirely supercede it. If the ground be well manured, it may be raised for several years successively upon the same spot. In the choice of land for its cultivation, a rich, sandy loam, and a deep dry black mould should be

preferred; cold, clayey, wet and gravelly lands should not be used. If it be new land it should be broke up the summer or fall preceding, and in the spring be brought to a great degree of fineness by tillage, or proper manure and tillage jointly if manure is required. The season for sowing is from the middle of April to the last of May; however the earliest time should be preferred, if the season is favourable.

As hemp is a plant of quick growth, and requires a great deal of nourishment in a little time, the land cannot be too well prepared by tillage, and proper manure; there is also an advantage in making your land mellow by your hemp pulling so much easier. The quantity of seed required to an acre if you use the drill is from four to six pecks, but if you sow it in the common way, from eight to ten pecks will be necessary. We recommend the drill method, being the most certain, producing the best stalks, exhausting the land, the least, and, in the end, we believe the most profitable. The quantity usualy produced per acre, is from seven to ten cwt. much however, depending upon the tillage given to the land. It is not considered as of more difficult culture than flax; it bears the drought as well or better than indian corn, and is not so liable to be cut off by an early frost. In some countries the male and female hemp are pulled together, but in others they are separated; when this is done paths should be made through the field lengthways, at about seven feet distant from each other, to allow a passage for the person who pulls up the male hemp from the other, the latter requiring to stand more than a month after for the purpose of ripening the seeds. The male hemp is known to be ripe by the fading of the flowers, the falling of the farina fecundans, and some of the stalks turning yellow.

It is better to pull hemp a little before it is perfectly ripe, than let it stand after, and if possible it ought to be worked while green; the hemp thus produced, being much finer than that which is previously dryed. The reason of this is, that this plant contains a great quantity of glutinous matter, which being once dried, aglutinates the fibres of the coat in such a manner, that they can never be afterwards pefectly separated.

After the hemp is pulled, it is taken in handsfull and the leaves, seeds, and larteral branches dressed off with a wood dressing knife; and the roots sometimes cut off. It is then made up into bundles in order to be steeped in water to rot it, a process similar to the rotting of flax, this method being much preferred to dew rotting, especially where clear or running water can be had. The length of time required for steeping hemp is various, being from six

to eleven days, the slenderest hemp requiring the most soaking, and warm weather greatly facilitating the operation; it is better, however, for it to remain too long, than too short a time; the operation is known to be finished by the bark separating easily from the reed.

After the hemp is sufficiently steeped, the next operation is to seperate the bark from the reed this is generally done by drying it and breaking it like flax, the instruments generally used for this purpose are all worked by hand; we think, however, that considerable improvement may be made in the dressing of both flax and hemp.

Beating of hemp is the next operation, which formerly was performed entirely by hand, but now in most places by a water-mill, which raises three or four heavy beaters that fall upon it alternately; the hemp being turned all the while to receive the strokes equally. The finer it is wanted, the more beating it must have. It is then hatcheled or combed through hatchels similar to those used for flax, and made fine or coarse as the hemp is required.

Further remarks on the culture of Hemp.

When pulled, it should be spread out upon the ground not more than an inch thick, and remain two or three days, being turned once, or twice, it will in this time be fit to house if the weather has been good, the sooner it is dried and housed the better. If the quantity be small, so that it could be dried under cover it would be better, heavier, and of a brighter greenish colour when dressed, more resembling foreign hemp. The attentive cultivator of this useful article neglects all other affairs to take care of his hemp at this stage of the business, if exposed when a shower or storm threatens, and fails not to get it under shelter. where it remains until Indian harvest time, when it is taken out and put to rot. When rotted enough it is taken up, washed and removed to dry ground, and set with the but end downwards, leaning against poles arranged for the purpose on crotches about three feet high, placing a bundle on one side of the pole, and another on the other side, alternately until the whole is set up; or it may be set against a rail fence in the same manner, being secured from blowing down. It is there to remain exposed to all the varieties of weather until the following spring. The first brake in which it is broken should have the teeth from three and a half to four inches asunder, the second the same as a flax brake.

XX. *Method of preventing the smut in grain, and which may possibly be efficacious in destroying the Hessian fly.*

Put a half hundred weight of stone lime into about seventy gallons of water, stir it well for half an hour, then let it stand for thirty hours, draw off the water, add to it three pecks of salt or so much as will make it bear an egg, (if sea water has been used, less salt will be required); when the salt is dissolved, the preparation (which you will observe, is salted lime-water) is fit for to be used. In this liquor, steep your grain, by putting small quantities in a basket, and setting the basket in the liquor. Whilethe grain is in the liquor, stir it that all may be wet and that the light grain may come to the top, these skim off, they should not be sown, most of them being infectious; this done draw up the basket, and let it drain a few minutes, and proceed to steep the remainder. This seed will be fit for sowing in twenty four hours; but for drilling forty-eight hours are better.

XXI. *On the Hessian Fly.*

These flies first appear towards the end of September, and soon after, their eggs appear hatched, in colour and size like a flaxseed. They are very low at the joints of wheat plants, some even in the ground and here they harbour all winter.

On their first appearance in any district, their numbers being small, they seldom cut off the crops, which is often the case the second and third year.

In the spring after warm weather, they again appear as a small worm, twist themselves round the wheat, as it begins to pipe; eat canker, and hill it; being gorged they become a chrysalis, from whence the aurela takes wings.

I would therefore propose—1st. That wheat should not be sown on poor land, but on that which is naturally rich, or that has been highly manured.

2dly. In such ground, it will be early enough to sow the first week in October, when the fly is mostly over.

3dly. When the fly first appears, prepare a large bush of elders, the more leafy the better; draw this over the wheat, as this shrub is obnoxious to all sorts of flies it will probably scare them off

4thly. Prepare a log roller, 18 inches diameter, four and half or five feet long, with a goage or gudgeon and nuts in the centre of each end, and a wooden frame fixed on it, on which may be placed a box to receive stones, to any weight required. It is believed that this roller if drawn over the wheat when the worms come out in the spring will crush them, besides being of great benefit in levelling the earth.

A roller is of so great a service in this way, that even should the fly happily leave us, no farmer should be without it, the expence is a mere trifle.

XXII. *Method of destroying or preventing the Hessian Fly.*

Take of the twigs and leaves of young elder of the summers growth, bruise them, cover them with water, and let them stand in an open vessel in the sun and air, twenty-four hours. In this preparation, steep, your seed wheat twelve hours, and sow it in the common manner.

XXIII. *On the culture of Tobacco, as practised in Maryland.*

In March a bed is prepared in some rich spot on the plantation, by burning a large quantity of brush upon it, and raking the surface fine. About the first of May, the seeds are sown in it, broad cast, and generally mixed with ashes, in order to disperse it more equally. The young plants are kept clear of weeds in the same manner as seedling onions, or cabbage plants, and like the latter, are fit to be transplanted, when about two inches high.

The ground to receive them, when set out or transplanted, is prepared with a narrow hoe, by digging holes of about a foot square, and the same depth, and three feet a part every way, in rows. This is termed holing. The earth about the hole, and that which came out of it is next formed into a hill over the hole, like cabbage hills, only larger. This is termed scraping. The hills being thus prepared, the first succeeding rain which wets the ground sufficiently, the plants are drawn from the beds, and planted in the same manner as cabbages, and where they fail, are replanted. When the plants are well fixed, and begin to grow, they must be kept clean from weeds, until their growth is completed. The Plant must be topt when the flower stalks begin to appear; this is performed by breaking off the the top with the finger and thumb, leaving from six to ten leaves, according to the apparent strength and vigour of the plants. The suckers also, which it puts out between the leaf and stalk, must be constantly broken off as they appear. About the first of September, and from that till frost comes, the tobacco ripens, and must be cut.

It is difficult describing it in this state so as to be certainly known. However, it is in general known to be ripe by the leaf putting forth yellowish spots, pretty thick over it; and having attained a considerable substance and richness. It is then cut down near the ground, and let lie till the sun

has softened it from its brittle state, that it may be housed without its leaves snapping off. It is then hung up in houses or sheds so thick as that the plants touch each other, where it remains for six or eight weeks to dry; and in damp weather, a gentle fire is made under it to prevent its moulding. Many planters give the fine Kitefoot a colour by curing it all together with hickory fires under it until it is dry. It is then stripped off the stocks in damp weather, and put up in bundles, the ends of the leaves being fastened together by having one leaf lapped round them. Upon being stript, tied up in bundles, and sorted, which should always be done while stripping, it is packed up in bulk till a convenient season for packing in hogsheads. This operation is performed in the folloing manner; the packer gets into a hogshead placed under a press, and has the tobacco handed to him which he places with the heads next the staves, all around and across the cask, until it is one fourth filled. This quantity they press down to about three inches depth, and let it remain under press several hours, and then pack the same quantity, and press it again; thus the cask is filled to the top, quite solid. A hogshead weighs from 750 to 1150 pounds in Maryland, in Virginia much heavier.

XXIV. *On the benefit of Salt in agriculture.*

The advantages of Salt in agriculture, are greater, perhaps, than is generally supposed. It may be put directly upon the land, or mixed with the fodder you give your cattle. Upon no crop is it more beneficial than Flax. It should be used in the proportion of about one bushel of salt to one bushel of flax-seed. Your flax will be well coated, taller and fuller of seed. The increase of this last article will generally pay the expence of the salt, being in most cases three bushels for one produced by the ordinary way of cultivating Flax.

It is also recommended to try salt upon oats, winter wheat and rye, and also upon Indian corn, at the rate of two bushels of salt to an acre. There is no doubt but that it will amply repay the expence.

XXV. *On the advantages of Plaister of Paris.*

Mr. J. Woolston, of Bucks county, Pennsylvania, prepared 14 acres of good new land, in the fall of 1787, upon which he sowed white wheat. In the beginning of March, 1788, he sowed 4 pound of clover seed, and three bushels of plaister of paris upon each acre of this ground. It produced 16 bushels of clean wheat per acre. Soon after the

harvest, a series of rainy weather came on, which lasted fourteen days, during this time the clover grew as high as the wheat stubble, and some time after, fully blossomed. When ripe, he cut and threshed it, the produce was twenty one bushels of clean seed, which with the wheat, he sold for 140 pound the price he had given for the land. By the use of plaister, clover may be kept in the ground for three years longer than its usual period. On a tough sward, it is necessary to sow four or five bushels to the acre. It meliorates and lightens the soil, turning it to a darker colour, so as to be plainly visible; and produces clover. For Indian corn it is better to strew it over the whole ground, than to put it in the hills, as when the fine roots, by which the corn plant is nourished, push themselves from the hills where the plaister is, into poorer soil, they must dwindle for want of that nourishment which the plaister affords.

An experiment was also made of plaister upon Indian corn, by a Mr. Longstreth of the same county. Of fifty acres of Indian corn, he plaistered thirty with about one eighth of a gill, to each hill, after the corn was come up, and before it was harrowed. The soil was a light loam; the hills five feet three quarters, by four feet asunder. On the thirty acres, he computes that there was an increase of two hundred bushels of corn more than the land would have produced without the plaister of paris, judging from the produce of the twenty acres on which no plaister was put. Twenty six bushels of the plaister was put on the thirty acres.

XXVI. *Method of improving Old Ground, to make it suitable for the culture of Flax.*

Let your land run over with grass, until June, then plough it in and dung the ground with sheeps dung, or yard your sheep upon it, plow it eight or nine times before winter. Early in the succeeding spring, plough it three times more, and at the last time plough in your seed with some ashes; roll the ground with a rolier, to make it smooth, and beat it down hard.

To increase the quantity of nitrous salt in the ground, let the ploughing be done while the dew is on; this is of material benefit; Wet land, where the water stands in the spring, or after a heavy rain should not be ploughed until it is dry. The ploughing of the land often prevents the generation of devouring insects. Part of the land may be sown early, the rest at or near the full moon in May. You may expect both crops to be good but one of these certainly will succeed.

XXVII. *On Clover.*

In Concord there was a farmer who raised in the year 1791 fifty two bushels and a peck of clover seed from thirteen acres, and sold it for four pound ten shillings per bushel, which amounted to two hundred and thirty five pound, five shillings. Another had twelve bushel off six acres, besides many others who had lesser quantities ; all sowed on their wheat, and had also many tons of hay the first crop. I saw the six acres, and think there was nearly two tons of hay per acre. Two of the plantations I have known near fifty years, and formerly they could hardly raise their own bread. They have very little natural meadow, and have used much plaister of paris ; but by sowing clover, their land is so much improved that their crops of wheat are now very good.

XXVIII. *On the culture of the Gooseberry.*

Gooseberries may be raised from cuttings, from seeds, or from suckers ; this last way is not, however, recommended, as bushes raised in this manner, are more apt to throw out suckers, than those raised from cuttings, or seed. A rich loamy soil suits this plant best, and for planting cuttings, the first of April is the proper season. The cuttings should be from six to eight inches long, and be set about a foot apart each way in rows, leaving about three inches of the cutting out of the ground. As they require the ground to be put in good order, previous to setting them out, so also is it requisite to keep it mellow, and clear of weeds until they are fit for transplanting. Frequent watering may be necessary during the first spring and summer, after the cuttings are set out, especially if the season is dry.

If the soil and situation is suitable, and the seasons have been favorable, they will be ready for planting out the third spring, after they were set out. Preparatory to this, the ground where you mean to plant them, should be well manured, and ploughed from ten to fifteen inches deep. Plant your gooseberries in rows, about six feet apart each way, taking care to cut out all dead and superfluous branches. The ground where gooseberries stand, should be kept clear of weeds, and every thing that would shade it, that they may have the full benefit of the sun and air. Gooseberries in general bear their fruit on wood of the second years growth ; care should be taken, therefore, each spring, while pruning them, to preserve so much of the growth of the preceding year, as will make a good bearing stock for the succeeding year ; and to take a way all of the bush that is more than four years old. The

middle of the bushes should be kept clear in summer, to admit a free air into them ; for which purpose the finest and strongest shoots should stand from six to ten inches from each other. Some give them an autumn, or winter pruning ; thining them out, and shortening the bearing shoots by cutting them off over the first wood bud, above the fruit buds : the fruit buds are known by growing in clusters, whereas the wood buds grow singly.

During the spring, and summer, all suckers that grow from the roots (except such as you want to save to renew the stock) should be taken out, leaving their stems clear and unincumbered.

Gooseberries are generally eaten, or used for culinary purposes before they are ripe ; yet being one of the most saccharine productions we possess, they might with more advantage be made into wine. Each pound of the juice expressed from the ripe berries requires only one ounce of soft sugar, whereas the ripest currants require double the quantity to induce the vinous fermentation. See further remarks upon currant and gooseberry wine.

XXIX. *Remarks on Pruning Fruit Trees.*

To the particular remarks that we have made upon the pruning of fruit trees when treating of the culture of the several kinds, we add these general observations. The pruning of fruit trees should be commenced in the nursery, and regularly continued until you cut your trees down.—Begin with the first superfluous branches, that you observe grow ; by taking them off when quite small, far less injury is done to your trees, the wounds given them soon heal, and few blemishes are left. You can also give your trees to the shape and form you wish them to have, much more easily when small, then if left without pruning till they are large.—*American Editor.*

The proper age, and season, for pruning fruit trees, is of the first consequence ; as we seldom meet with an orchard that has been judiciously managed, in this respect. To ensure success, there is required not only the eye of an accurate observer, but also a complete knowledge of the various kinds of fruit bearing trees, their peculiar natures, and habits ; because almost every different sort must be treated in a different manner. Many of these commonly produce their fruit on the shoots of the preceding year, such as peaches, nectarines, &c. others again on branches which have attained the age of three, five, fifteen, or twenty years ; for instance, pears, plums, cherries, &c For the proper nursing and training of all these trees, it will be indispensably requisite to attend to

this circumstance, that a sufficient portion of fertile, or bearing wood be left in every part of the tree ; at the same time it would be prejudicial to the growth and health of a tree, to leave too many useless branches which only tend to exhaust their nutritive powers and eventually to accelerate their decay.

On the whole, it deserves to be noticed that peaches, nectarines, apricots, cherries and plums will thrive more vigorously, when they are pruned with a sparing hand ; as otherwise, they are apt to bleed profusely, or to part with such a quantity of gum, as will often prove fatal ; hence the safest method is, to remove superfluous twigs as soon as they appear. By such management, the trees above aluded to, may be preserved in a prosperous condition ; and they will grow with greater regularity, and less trouble, than by the common method of clipping them promiscuously.

Apple, pear, plum, and cherry trees yield their fruit on young sprigs that proceed from boughs of several years growth, a sufficiency of such branches should, therefore be left, that room may be afforded for the quantity of fruit that the tree is supposed able to bear. On the contrary as peaches and nectarines bear their fruit mostly on branches of the preceding years growth, such branches should be left in numbers proportioned to the degree of strength observed in the tree ; and to make room for a future stock, cut out those that have already borne fruit for one or two years past, never leaving more of such small branches upon any main limb of a tree than it seems capable of supporting.

XXX. *Method of preventing the destruction of Apple Trees by Canker Worms.*

The insects from which the canker worms are produced, are hid in the ground, near the root of the tree, not far from the surface, and make their appearance, as soon as the snow is off, and the top of the ground soft (which sometimes happens as early as February). The males have wings, and frequently fly directly to the limbs, without touching the body of the tree ; fortunately the females have none, but are a very clumsy bug, and very easily stopped by tarring the tree. To do this with success, it is very necessary that the tar made use of, be of a proper consistence. Tar, that being exposed to the sun through the day becomes so soft, as that it can be laid on with a brush, is the kind. The rough bark should be first scraped off with a hoe, or some convenient instrument, and the tar put round the tree about four inches wide ; this must

be repeated every day when the state of the ground will permit them to move, till they have done going up. As they seldom begin to move till the middle, or last of March, if the weather continues warm, they will all be out of the ground in about fourteen days; it will generally be necessary, however, to tar twenty times, perhaps oftener, as they are sometimes interrupted with snow or cold. The time generally chosen to begin, is, about two hours before sun set, (which is the time the insects begin to move) and if not finished till an hour after the sun is down (after the first time) it is immaterial, for the tar that is already on the tree, softened by the warmth of the sun, will be sufficient to stop them till that time. A barrel of tar will be sufficient to do an orchard that will make an hundred barrels of cyder; and four persons in two hours will be able to tar the whole once over If the tree be thrifty, it will be necessary, some time in the summer following to scrape off the tar, or make a few incissions through it, to prevent the bark from being confined.

Remarks on the culture of Fruit Trees.

Seedlings from apples will scarcely ever produce fruit exactly similar to the original, yet may produce excellent fruit, some even superior to that from which the seeds are taken. Seeds from the largest and best kind of fruit, and from trees of a strong and rapid growth, should be taken to plant. Young trees, which produce a strong shoot, and large rich looking leaf, should be left to bear fruit, before being grafted: such generally bear fruit of a good quality.

It is best to perform the operation of grafting in, or near the ground, except on such stems as incline horizontally, or are small weak shoots; these may be grafted high enough to form a top. The nature of the stock grafted upon, has great influence upon the fruit, in respect to bearing, size, and flavor, and also on the durability of the tree. If possible, winter fruit should be grafted upon a stock which naturally would bear winter fruit; summer fruit upon a summer stock, &c. All fruit will in some degree partake of the nature of the original stock, even in their disposition to bear annually or biennially, to bear early or late fruit and to bear fruit good for keeping, or liable to quick decay.

In nothing so much as pruning is great care necessary, and experimental knowledge useful. In general it may be observed that, apple trees should be so pruned, as to leave a round, even, open and rather flat, than high top, if any difference is made, let there be more branches on the west and south west sides, than on the opposite; this is

to shelter the trunk of the tree from the direct rays of the sun, which is frequently injurious. A top formed upon the foregoing plan of pruning, will be must benefitted by the warmth of the sun, the dews, and rain, and must conduce to the regular, and quick growth, and great duration of the tree; the fruit also will be better in quality, and more in quantity, than if the top is crowded together.

Pruning should commence the second or third year after your trees have sprouted from the ground, or so soon as you see unnecessary, useless, or hurtful branches growing upon them. The sooner these are cut off, the sooner the wounds heal; and pruning should be continued every year until your trees are finally cut down.

Pennsylvania method of preventing the worm injuring Peach Trees.

Clear away the gum that issues out of the tree affected by the worm, strew a little flour brimstone round the root cover it lightly with fine mould, that it may not blow away, yet so that the sun may operate through, and cause the brimstone to fumigate, which destroys the worm.—On pound of brimstone will be sufficient for near two hundred trees.

XXXI. *On Thorn Hedges.*

The most permanent hedge fence is the thorn; but being troublesome to propogate, and slow in its growth, we think a few words upon its culture, will not be unimportant to farmers.

The acquisition of quicks has hitherto been the greatest difficulty But the writer happily has learned the method practised by those who follow rasing quicks in Europe, and which he with pleasure communicates to the public. Gather the haws when full ripe, perhaps in November; dig a pit or hole in a dry bank or hill, from two to three feet deep; put in the bottom a layer of dry straw; throw your haws upon the straw, and cover them with the same then fill in the earth, and do it so neatly, as to prevent the water soaking to them. In March, or April according to the season, raise them, and with an open riddle, sift the sand or mould from them (though getting them clear is no way material): they will now be clear of their meat, and just their nut or kernel remaining, which immediately sow in beds of well prepared ground, nearly in the same manner parsnips are sowed, leaving sufficient space between for a person to pass to weed them. It should be observed, that the nearer the quality of the soil, in which they are

sown, is like that into which they are to be transplanted, the more likely they are to thrive, after being removed; and by the way, the same remark may be made upon every product of the vegetable kingdom. If the ground for the haws, be well prepared, they will come up as soon as any garden seeds; and if kept clean and weeded, they may be transplanted in hedges in two years.

In no stage of the business of raising hedges, is there more errors committed, than preparing to transplant them Some suppose that a bank, three or four feet high, should be raised, to set them upon, even upon high and sandy land; others are of opinion that a ditch should be dug to set them in, and that when upon a low flat clayey soil. These methods, common sense should inform us, were the extremes of error. There are some soils where neither bank or ditch is required, and where either would be injurious. In such, no other preparation is necessary, than to draw two or three deep furrows, throwing the soil on each side towards the centre, or where the hedge is to stand; then by one furrow, open a channel to set your thorn plants in. In fact, could your land have two or three good ploughings, the autumn previous to your setting them out, it would be a good preparation. If you desire to have a good hedge, set two or three rows of plants, five or six inches from each other, and the plants in each row, about the same distance apart, always letting a plant in one row, stand against a vacancy in another. As it is of great advantage to have your ground in good order, previous to setting out your hedges, so also is it necessary to keep it clear of weeds, stones, and every thing that could obstruct the growth of your young plants; many a promising hedge has been completely choaked up, by having small stones thrown into it, till the thorns could no longer grow. Large trees should not be suffered to grow in a hedge; their shade hinders the growth of, and finally kills the thorns.

From the remarks made upon setting out hedges, where neither bank or ditch is required, the variations necessary to be made, in different soils will be obvious to every intelligent farmer. In low flat clay land, a bank may be required one, two, three, or even four feet high; these should always be of sufficient width for two or three rows, of thorns, the same as if planted without a bank. Where a bank is required, it should always be thrown up long enough before hand, for the inner turf, &c. to become mellow, and fit to receive the thorns. It is hardly necessary to observe again, that the ground should be put in a good state of preparation, and be kept clear of weeds, stones,

&c. as much when your hedge is on a bank, as when it is on a level.

With respect to planting in ditches, it can so rarely be done to advantage, that it is not worth while to remark upon it.

It will perhaps be expected that something should be said upon pruning of hedges. If set as thick as they ought to be (and while doing it, very little more trouble or expense is required to set them thick, than to set them thin provided you have a supply of plants) they will require no lopping or topping, especially for the first three or four years such branches as grow out on each side should be cut off, once a year, with a proper pair of hedge or pruning shears. This is a work that may be very expeditiously performed by a person acquainted with the process, and having proper shears. It would also, much forward the growth of your hedge to loosen the soil round the roots, once or twice a year, for the first three or four years after it was set out; this would give an opportunity of clearing out every thing that was likely to hinder the growth of your plants. Let it always be remembered, that a thorn hedge should have nothing but thorns in it, the same as a corn field should having nothing but corn in it; and that the same soil and nearly the same cultivation, is most suitable to both.

Should pains be taken to plant your haws in rows across your field or nursery, they may be taken up with a plough, and if planted in a furrow again, the trouble of transplanting a hedge will be reduced to a mere trifle.

XXXII. *On the cultivation of the Chesnut Tree.*

This tree being very valuable for many purposes, ought to be carefully attended to by the people of the United States. The durability of the timber, the facility with which it can be split, the little sap it contains, compared with most other trees, and the quickness of its growth, all recommend it to the attention of every lover of rural economy; not to mention the value of the nuts, which are no inconsiderable article of profit.

The timber of old Chesnut trees having been found by experience to be more brittle than that of young, it is recommended that they be not suffered to stand longer than while they continue growing. If cut while they will square from six to eight inches, the timber is very durable having but little sap compared with other trees.

This tree may be propagated by planting the nuts, which should be left in the burr, as a defence against field mice, the Spring is recommended as the best time for planting.

Your seed may be selected either from the Chesnuts of Spain, Portugal, or the United States, and either the common small, or Horse chesnut; the latter is recommended where the object is the timber, and not the fruit.

In the culture of this tree (and indeed of all forest trees) we shall probably differ from all nursery men and gardeners, who have heretofore wrote upon the subject. Instead of recommending them to be planted in nursery's, and afterwards transplanted to the fields where they are to grow, we advise to plant them in the field at once, making a nursery of that, and save the trouble of transplanting.

The transplanting of forest trees can only be recommended where the use of a few acres of land for three or four years is a very material object, and where labour is poorly rewarded; no other circumstance can induce the planting in nurseries.

As in no parts of the United States, (except in the neighborhood of large cities) is the use of a few acres of land of such material value, we recommend the preparing of, and planting the whole of the land you wish to cover with forest trees, whatever the kind may be; and in the planting of Chesnuts the following directions will be of use to observe.

The Chesnut may be planted upon almost every soil, but moist or marshy lands. A light loam, or loam and sandy soil suits it best. Let the fields that your are going to plant, be ploughed two or more times the summer, and fall preceding the spring when you intend to plant; this ploughing should, if possible, be to the depth of twelve or fifteen inches. If your land be thoroughly broken up, and made mellow in the fall, no spring ploughing will be necessary; if not, it will be requisite to plough it again in the spring and harrow it level Should it not require ploughing in the spring, it may be planted somewhat earlier, and in either cases you must plant as soon as the season will permit.

When your land is in proper order for planting, proceed to set your nuts, or nuts in the burrs, making a drill with a hoe about four inches deep, and not less than twelve, nor more than eighteen inches apart each way throughout your field. Possibly steeping the nuts, or the burrs (if planted in burrs) previous to planting them, might be of advantage, perhaps as much or more so, than steeping grain; I do not recollect, however, that this method has been tried, but this much we may remark, that the seeds of every vegetable production, that nature plants without our assistance, is previous to its sprouting, steeped by a winters rain or snow. How far we can benefit by taking the hint, and steeping all such seeds as we save dry through the winter, experience must determine.

My reasons for planting the seeds of forest trees in the fields where they are to grow, are, 1st, that most, if not all vegetable productions flourish best when they originally sprout in that soil where they are destined to grow. 2dly, that the trouble and expense of transplanting them is saved. 3dly, the riskof transplanting them is avoided. 4thly, the expense and trouble of preparing the ground to plant them in, in the first instance, is no more than the expence and trouble of preparing the ground to transplant them to in the second case, and 5thly, the trouble of attending them is increased in a very inconsiderable degree.

It should be remarked further, that they are recommended to be planted much closer together than they can possibly continue to grow long ; this is a provision against a part of them failing ; it is also extremely beneficial to young trees to grow so near together, as that their joint shade may nearly cover the ground in summer, and their joint stock of leaves cover the ground in winter, their roots are thereby kept warm, and a valuable manure is spread upon the ground.

It is perhaps one of the wisest provision of nature, that the decayed substances of each kind of vegetable, is the best manure for to aid and assist in reproducing such vegetable. In this view the decayed leaves, the young trees, and the decayed roots of such trees as are taken out to thin them, will very much benefit the trees that remain.

For four or five seasons after planting your trees, they should have at least one dressing with a hoe in each season, to keep down weeds, &c. and to make the ground mellow ; the dressing that they may want, will much depend upon the previous preparation that the ground has had, and the state it was in at the time of planting.

Upon thining them out, either by digging them up, or cutting them down, we remark that the smallest and least flourishing plants should always be taken, leaving the best to grow, that they should be taken out, evenly over the field, and be taken out no faster, than just to leave room for those left standing, to grow, and keep the ground shaded.

Chesnuts, upon a congenial soil, plated and dressed in the manner above directed, would in six or seven years afford a considerable profit from the cuttings, and would shortly pay a sum equal to the interest of the cost of the land, and the expense of planting ; this income would increase till you might think proper to cut your forest down, which supposing it to be at the end of fifty years, the income would probably be for the last twenty years not less than one hundred per cent per annum In a country like the United States, where property is secured to its right-

ful owners, a more productive legacy could not be left by a parent to an infant, than a plantation of chesnut trees.

Among the various uses to which the nut may be applied, that of making paste for shoe-makers, book-binders, card manufactorers, and paper hangers, are not the least. To prepare it for their respective uses, take off the hard shell, as well as the inner skin; then divide it into three or four parts, let it be dried hard in an oven, and reduced to a fine flour, either in a mortar, or mill; to this flour, rain or other soft water is added, and the whole stirred well together till it acquire the proper consistence of paste. This paste possesses a great advantage over the common size; as no moths, or vermin, will breed in the articles cemented with it. Should it be necessary to let this paste stand more than forty-eight hours after being made, before using, it is apt to sour, or become mouldy; to prevent this, let a little alum be dissolved in the water before using it; such precaution, however, is not necessary, when intended for immediate use.

XXXIII. *Remarks on the culture of the Oak.*

In speaking of the chesnut, we have remarked generally upon the cultivation of forest trees. As each kind will, however, require some little variation, either in soil and situation, or in their management at some period of their growth, we shall occasionally remark upon each particular forest tree, the cultivation of which we think it important to recommend.

The oak thrives better in hilly than in boggy ground, but flourishes most luxuriantly on rich black soils, or in strong moist, deep loams; and, while it is young, in large plantations.

The best method of propagating it, is by sowing the acorns in ground prepared as for a nusery. They should be sowed so thick as to be a protection to each other, from the heat of summer, and cold of winter, perhaps every nine or twelve inches each way over your field. Could they be planted with a drill, it would save time, less acorns would be taken and they would be more equally and regularly distributed over the ground.

As they advance in size, select the stronger ones to stand, and occasionally cut the weaker ones down. The roots of the oak strike deeply into the ground; transplanting of them, therefore, should not be thought of, as they rarely grow well if removed from where they originally sprout.

This tree is remarkable for the slowness of its growth, its great bulk, and longevity. It is observed that the

trunk in general does not attain to more than from fourteen to eighteen inches in diameter, in the course of eighty years. But after ariving at a certain age its bulk rapidly increases.

So many are the uses to which the various parts of this valuable tree may be applied, it is unnecessary to urge any thing in recommendation of its culture. To increase the strength, weight, hardness, and durability of the timber, the tree should be barked, and left standing for three or four years; it thus becomes perfectly dry, and the inspissated sap renders it much stronger than the heart of any other oak tree, which has not been stripped of its bark.

Besides the timber, the bark, the leave, the acorns, the galls, the oak-apples, or their expressed juice, are useful in various manufactories.

In forming plantations of the oak, pains should be taken to procure the acorns from the most valuable species, and from thirfty growing trees of a middle age. The following are the kinds considered most valuable. The white oak, great black oak, spanish oak, iron oak, and (for the southern states), the live oak, all of which are worth the attention of those who wish to improve the value of their estates.

XXXIV. *On the cultivation of the Poplar Tree.*

Of the various species of this tree, the Italian, or lombardy poplar is thought to be the most useful, and ornamental. All the kinds of poplars may be propagated either by layers, cuttings, or suckers, which should be planted in a nursery two or three years previous to their removal. The most proper time for planting suckers is in the month of April. If cut from twelve to eighteen inches long, and set from eight to twelve inches in the ground, they will speedily take root, and if the soil be moist, will in a few years attain to a considerable size.

The lombardy poplar is a native of the northern parts of Italy; it also flourishes in moist situations; but will not succeed if its roots are to long covered with water. On account of its rapid growth, this species is greatly esteemed for ornamental plantations; its cuttings are useful for hop poles; the wood being soft, free from knots, and easily worked, it is much employed by joiners, carpenters, and cart-wrights; it may be wrought into very flexible shafts for carriages, or fellies for wheels. Farther it forms excellent masts for small vessels, and when sawed into boards, is excellent for packing boxes, because yielding to the nail, it is not liable to split. Lastly, it appears from

numerous experiments, that the Italian poplar affords a dye of as delicate a lustre, and equally durable, as the finest yellow wood; its tinging matter is more readily extracted, but instead of striking a proper green with indigo it changes into an olive shade. The dry branches are preferable to those in a green state; nor should they be cut or bruised; being possessed of the property of fixing the colours obtained from brazil and logwood.

XXXV. *Method of destroying Catterpillars upon Trees.*

Take live coals (of wood) in a chaffing dish; throw thereon some pinches of brimstone in powder; place the same under the branches that are loaded with catterpillars. The vapour of the sulphur, which is mortal to these insects, will not only destroy all that are on the tree, but prevents its being infested by them afterwards. A pound of sulphur will clear as many trees as grow on several acres A chaffing dish, or something to contain the coals may be fixed upon a pole, and put near to their nests.

XXXVI. *A certain cure for the Measels in Swine.*

About once a week, mix two spoonfals of madder in their food, and on some other day in the week give a spoonful or two of an equal quantity of flour of sulphur and salt petre well pounded and mixed. These may be given in their food.

CHAP. XIX.

ESSAYS IN DOMESTIC ECONOMY, &c.

I. *To make Cyder that will keep any length of time, without the trouble of frequently drawing off.*

Take the largest cask you have, from a barrel upwards; take out one head, put in a few sticks, so as to raise a vacancy of two or three inches from the bottom; over these sticks lay a clean old blanket, or, if that be not at hand, a quantity of the swingling of flax. so as to make a coat of about a quarter of an inch thick when it is well pressed down; then put in so much clean washed sand from a beach or road, as will cover about six or eight

inches in depth ; have this cask fixed where you can conveniently pour your Cyder on this filterer, and draw it off. Then first pass your Cyder through a cloth as it comes from the press, which takes out the pumice, and then pour it gently upon the sand, through which it must be suffered to filter gradually, and be drawn off by a tap fixed in the side, and near the bottom of your vessel. By this easy method your Cyder will be made as clear as could be expected, after the most laborious process of refining ; and all the mucilaginous matter, which causes the fermentation and souring of Cyder, will be so separated as to prevent that disagreeable consequence.

N. B Other methods may easily be invented of passing the Cyder through the sand, which is the only essential part of the above process.

II. *To make Mead.*

Take the white of twelve eggs, mix them well in twenty-four gallons of water, to this put forty pounds of honey Boil the whole one hour ; then put in a little ginger, and a little cloves, or cinnamon, or mace, or pimento, or a very small quantity of each, as may be convenient. When the Mead is cool, add a spoonful of yeast, and pour it into a cask, which should be full that it may work out at the bung. When the fermentation is over, close the cask, and put it into a cellar, or vault, where no changes in the temperature of the atmosphere will affect it. When it has stood six or eight months it will be fit for use, and may be bottled off. Some prefer to omit the spices, which may be done, and good Mead still be made.

III. *An approved method of preserving the fine flavor of Butter, and of preventing its growing rancid.*

To a peck of fine salt add one ounce of crude sal ammoniac, and two ounces of salt-petre, both finely powdered ; mix them very well with fine salt. With a little of this mixture, work your butter, until the butter-milk be entirely extracted. Then pack it in wooden firkins, salting it with the same mixed salt, to such a degree as to be palatable, when eaten with bread, and no salter. The mixture is stronger than fine salt, of consequence something less is required.

IV. *Another excellent composition for preserving Butter.*

Take of common salt, two ounces ; salt-petre, one ounce ; sugar, one ounce ; beat them up together, so tha

they may be completely blended. This quantity will be sufficient for four pounds of butter, with which it must be well mixed, and the butter closed up for use. Butter prepared in this manner, is more effectually preserved from any taint of rancidity; looks better, tastes sweeter, richer and more marrowy, than if it had been cured with common salt alone. It will also keep good for three years, and cannot be distinguished from that recently salted. It should, however be remarked, that Butter thus cured, does not taste well until it has stood a fortnight or three weeks.

V. *On salting Beef.*

In cutting up your Beef, use a long sharp knife to cut the flesh, and a steel back saw to cut the bone. To each barrel put half a bushel of Liverpool salt, two or three pounds of coarse brown sugar and four ounces of saltpetre. Let your cask be well hooped and pickled, and pack your meat close. This is particularly recommended for beef to ship.

VI. *Method of curing Hams, to resemble those of Westphalia.*

Rub each Ham over with dry salt, and let it stand 24 hours to drain off the blood. Then prepare a pickle of the following ingredients; the quantities mentioned being sufficient for one ham of a middle size. Take one pound of brown sugar, a quarter pound of salt-petre, half a pint of bay salt, and three pints of common salt; incorporate these ingredients in a iron pan over the fire, stirring them continually till they acquire a moderate degree of heat These make a pickle, and in this your hams most remain for three weeks, frequently turning them that every part may have the benefit of the pickle; in this time they will be ready to smoak.

VII. *Method of purifying Tallow, to make Candles.*

Take five eights of Tallow, and three eights of mutton-suet; melt them in a copper cauldron, with half a pound of hot water to each pound of grease. As soon as they are melted, mix eight ounces of brandy, one of salt of tartar, one of cream of tartar, one of sal ammoniac and two of pure dry pot-ash. Throw the mixture into the cauldron; and make the ingredients boil a quarter of an hour; then let the whole cool. The next day the tallow will be found upon the surface of the water, in a pure cake. Take it out, and expose it to the action of the air, on canvass for

some days. It will become white, and almost as hard as wax. The dew is very favorable to bleeching. Make your wicks of fine, even cotton ; give them a coat of melted wax ; then cast your mould candles. They will have much the appearance of wax ; and one of six to the pound will burn fourteen hours and never run.

VIII. *To preserve Parsnips and various other roots.*

Take them up in April, wash the earth from them, and dry them, either in an oven after bread has been taken out, or in the sun. If made perfectly dry, they will keep any length of time, even for a voyage round the world.

To prepare them for cooking, soak them in warm water, for about an hour; they become tender, and sweet to the taste as if fresh drawn from the ground.

We remark further, that there is no doubt but that many kinds of roots, and fruit might be preserved by drying and be very useful either in families, or to take upon long sea voyages.

IX. *Chinese manner of curing Ginseng.*

They gather the root sound and good, (not when the plant is in flower) and gently wash the earth from it, being careful not to break the skin. Then in a very flat iron stew pan, boil some water, put in the root, and let it lie three or four minutes, but not so long as to injure or break off the skin, when on cutting the root, the inside will appear of a light straw colour. They then take a clean linen cloth, and having wiped the ginseng clean and dry, they place the stew-pan over the gentlest fire, and lay in it a row of ginseng. Here they let it dry gradually, turning it leisurly, till it is something elastic, but not too dry ; afterwards they take a damp clean cloth in which they roll up the longest pieces in parallel lines, and wrap them up very tight, binding them hard round with thread ; after being dried a day or two by a very slow fire, they unpack the same, and repeat the packages of the inside and moist part, until it is all like the outside, and the whole dry enough to sound like a piece of wood, when dropped upon a table. The heaviest pieces, of a straw, or light brown colour, are the best.

To preserve the same.

They take a box well lined with lead, and put into a larger one with quick lime, (to prevent vermin) and close the whole against air and weather.

X. *On the culture and curing of Ginseng. Another way.*

Ginseng should be collected in the driest days in October, and immediately after it comes out of the ground, should be spread on boards under a shelter where the wind can blow freely, and when dry, the dust can be brushed off. It should have no connection with the heat of the sun or fire, or be washed. When one barrel is put up so, it will fetch more than fifty barrels cured the other way.

XI. *On the manufactory of Kelp.*

Kelp is made of the different sorts of sea weeds thrown upon the, shore or gathered upon the rocks, which must be dried a little in the sun, and afterwards burnt in a kiln made of stones found upon the shore: this kiln is made in a cylindrical form, about two feet in diameter. In this is burnt a small parcel of the weed, and before it is reduced to ashes, more is thrown on till the kiln is full, or the meterials are expended. This reduces the ashes to a hard and solid cake, by the heat of the kiln, and quantity of salt in the herb. Thus the Kelp is reduced to a kind of pot-ash which is used for making alum, common glass bottles, and hard soap.

XII. *On making Barilla.*

Barilla is made from a weed commonly called sweet fern, which when it has attained its growth, is cut down, and let dry, afterwards it is burnt, and calcined in pits, like lime kilns, dug in the ground for that purpose, which are closely covered up with earth, so that no air may come at the fire. The matter by this means, in not reduced into ashes only, but is made into a very hard stone, like rock salt, which is forced to be broken with hammers to get it out. Barilla is used in soap and glass manufactories, &c.

In addition to the above, it may not be amiss to observe, that there are many plants and weeds that grow in great abundance in the United States, and which could, no doubt, be converted into ashes, &c. and very useful in many manufactories.

XIII. *Method of making Pearl-Ashes as practised in Hungary and Poland.*

Most of the manufactories of calcined, or pearl-ashes in Hungary are carried on in the woods. The buildings they use, are wooden sheds slightly put up, so as to be taken to pieces and carried from one forest to another.

They find the oak tree, which bears acorns, to be the best, wood, and always prefer the oldest. Twelve and a half bushels of ashes makes one hundred weight of calcined, or pearl ashes. There is, however, a great difference in the nature of the wood; that cut in the forests of Canissa and Tjagadorn yields double the quantity of lixivial salt which the wood does in the forests near Eperies under the Carpathian mountains. This ought to make people cautious in their choice of proper wood; too much attention cannot be had to this point, although to some its importance may not appear at first view.

When the wood is felled and cut into billets, it is burnt on a large hearth in a kind of kiln; they commonly place them at the side of a hill, and throw the wood down the chimney into the fire. They keep the ashes several months in a dry place, as the salts are discharged more readily after the ashes have been preserved some time, than from new ashes; they also sift the ashes to get the charcoal out, for when the charcoal, left in the ashes comes into the lye vats, it soaks in a good deal of the lye, which is a great loss.

Of lixivating the ashes.

To lixivate, or draw the salts out of the ashes by filtering them, they use casks about the size of a hogshead; they are about two feet ten inches high, and have a double bottom, the uppermost is placed nine or ten inches above the under one, and is bored with several holes to let the lye through; the undermost has a hole to let the lye drop gently into a trough or receiver; the space between the two is filled with straw. Twelve or fourteen such casks being ranged in a row, upon a trough, are filled with ashes and by means of a gutter laid upon the casks, with a hole corresponding to each cask, water is conveyed into them from a pump; this water passing through the ashes, carries their salts along with it, and so long as it is coloured, they continue to let it run through, after which they shift the ashes, and the last of the lye thus procured, not being strong enough, is poured upon a second or third cask, till it so strong that an egg will swim in it. The casks used for this purpose are made of oak; pine is improper; it impregnates the lye with a resinous matter, which is found to give a bad colour to the pearl ashes. Though we have mentioned oak casks, as preferable to pine, yet oak is subject to an inconvenience; the staves warp by means of the lye, and the casks soon leak. White cedar vessels are best, this wood being equally free from the inconveniences of both the former. Where this wood is not readily pro-

cured, cypress or white pine might answer in its place. The lye when drawn off, is kept to settle and depurate in receivers on cisterns; they are careful in this part of the process, to have the lye as clear as possible, for on this point depends the fine colour of the pearl-ashes. Indeed, too much attention cannot be paid to having the lye clear, and should it still remain impure, after standing to settle, the defect may be remedied in this manner :—When the lye first boils in the kettle hereafter described, the dregs will settle, and may be lifted from the bottoms of the kettles with a ladle.

Of evaporating the lye.

When the lye is thus procured, they proceed to evaporate the wartery particles by ebullition, or boiling; this they call making black pot ash. For this purpose they use iron pans, much like those used in making salt: they are about four feet diameter at the top, and near three feet at the bottom. Between every pair of these pans, they have a brass boiler, considerably less than the pans—They are fixed in masonry like a sugar baker's row of of pans, with a fire place below them, and an open chimney to carry off the steam. They use, according to the largeness of the work, three, six, nine, or twelve pans and boilers. Suppose they work only two iron pans, and the boiler, they begin by filling one pan, and the boiler with lye, and then making a fire: in proportion as the lye evaporates and diminishes in the iron pan, it is supplied with boiling lye from the boiler, which is again supplied with cold lye.

When the first pan has boiled ten or eleven hours, they begin the second, and supply it continually from the boiler as the first was supplied, and when the salts begin to thicken in the first pan, no more lye is added, but the fire is continued, and the mass becomes thick and hard, this is what is called black pot-ash; it is cut into pieces, taken out, and fresh lye put into the pan, and the operation continued. When the first pan is half evaporated, the second is begun, by which means they never discontinue the work, till they have finished the lye.

Of calcining the black pot-ash.

The process of calcining the black pot-ash, rendering it of a fine whitish blue colour, and able to stand the weather, without running into a liquid, is performed in an oblong furnace, in the midst of which, there is a hearth, with a border of bricks somewhat raised, to prevent the

pot-ash from falling into the fire during the calcination. There is a door to the hearth, through which the pot-ash is put into the furnace, and a door on each side to put wood and fire into the fire places. The furnace is arched over with a double arch ; three holes are contrived in the centre of it, to carry off the smoke and vapors into the chimney, which is placed at the front of the furnace.

When a sufficient quantity of black pot-ash is ready, they begin to calcine, and make it a rule never to leave off, or let the furnace cool, till they have finished the whole. The black pot-ash is broken into lumps, about the bigness of a man's fist, and spread upon the hearth five or six inches thick, the iron door is then shut, and a gentle fire is made, taking care to prevent the pot-ash from running or melting, which too violent a heat would occasion.— When the pot-ash grows red hot, it must be stirred with an iron rake to make it calcine equally ; when it whitens the flames becomes bright, and the fire is increased to the greatest degree, but so as by no means to melt the black pot-ash. When they want to know if the calcination has succeeded, they take a few lumps out, and if, in breaking them, they find them white in the middle, it is a sign they are enough done. The iron hearth door is always kept shut, except when they are stirring the black pot-ash ; but in order to observe the progress of the calcination, they have a small hole or door, in the iron hearth door, through which they look into the furnace. When the calcination is finished, the pearl-ashes are raked out upon a pavement before the furnace, and packed into casks of fifteen or sixteen hundred weight. When the furnace has cooled a little, more black pot ash is put in to calcine ; and by the workmen relieving one another, they continue calcining till all the black pot-ash is done. Four men and a boy will make forty-two tons of pearl-ash in a twelve month, if the work is rightly understood, and properly carried on.

Pearl-ashes thus prepared by calcination, are more valued ; consequently bear a higher price, than a common vegetable salt melted in the pan. The pearl-ashes can be put to every purpose, on account of the colour ; whereas, that melted, cannot for the same reason. Calcined, or pearl-ashes stand the weather better, and do not so readily run to a liquid, as the melted. The same quantity of lye will make a ton of calcined, or pearl-ashes, as goes to make a ton of melted pot ash of the same strength But the former will be more valuable, and fetch a better price at market.

In addition to the foregoing essay on the manufacture of pearl-ashes, the following remarks upon the method practised in the United States are not thought improper.

When the lye is prepared, and made clear by standing as before directed, the watery parts are to be evaporated by boiling.

For this end, two or more pans are fixed in mason work, side by side, with a fire-place under the whole, and an open chimney to carry of the steam. These pans are usually about four feet diameter, their depth about half the breadth, rounding regularly from the margin to the bottom, so as to form the half of a hollow globe, or a figure nearly similar The pans are to be filled with lye and a strong fire kept under them. As the watery part evaporates, the salt forms upon the bottom and side of the pans, from whence they are taken by a ladle, and put into a small pan (fixed also in mason-work) with a fire under it, to evaporate the remaining watry particles.

As the lye diminishes, and the salts form and are lifted from the large pans, fresh lye must be added, and this operation continued, as long as a supply of lye can be had, without suffering the kettles to cool. Two, four, or six kettles may be made use of according to the extent of the design.

CHAP. XX.

MEDICAL RECEIPTS, &c.

I. *The most easy and certain method of preserving men, and animals who have been bitten by mad creatures, from being seized with the disorder usually called the canine madness, or hydrophobia.*

This remedy is made known by professer de Meder of Friburgh, and is prepared as follows:

Dilute thirty grains of the surgeous caustic stone (called the Lapis infernalis, by drugistis) in one pound of water. If the wound be small and deep, dilute it according to art, and then cleanse it well with the aforementioned lye. If the sensibility of the part will permit, let it be bound up with pledgets well soaked in the lye, laid thereon ; but if the part be very sensible let it be well washed with the lye, which may be again washed off with common warm water, and then bound up with dry bandages.

This cleansing by means of the lye, may be often repeated every day, provided there be no inflamation.

All the wounds that have been treated as above, are to be healed in the usual manner.

II. *Receipt for the cure of the Scurvey, Leprosy, &c.*

This medicine is an agreeable vegetable syrup, easily made, pleasant to take, mild in its operation, and attended with the advantage of knowing every ingredient of which it is composed; they are, of a male speed well, four ounces; bark of elder, two ounces; winters bark, three ounces; angelica root, sliced thin, eight ounces; cumfrey root, and fennel root sliced, of each four ounces. Boil these together over a slow fire in two gallons of salt water, till one half is consumed; then strain off the decoction into a clean earthen pan, and let it stand all night to settle; in the morning, carefully pour off the liquor from the sediment, and in this liquor, dissolve three pound of treble refined sugar, and two pounds of virgin honey, which are to be gently simmered into a thin syrup.

The dose is a large tea-cupful, night and morning, or in some cases, morning noon, and night, adding to each dose, at the time of taking it, a small tea-spoonful of Dr. Huxam's essence of antimony, which greatly improves the medecine.

III. *The negro Cæsar's cure for poison, for discovering which the assembly of South Corolina purchased his freedom, and gave him an annuity of one hundred pounds.*

Take the roots of plantane, and wild hoarhound, fresh or dried, three ounces, boil them together in two quarts of water to one quart, and strain it; of this decoction let the patient take one third part three mornings fasting, successively, from which, if he finds any relief, it must be continued until he is perfectly recovered; on the contrary, if he finds no alteration after the third dose, it is a sign that he is not poisoned, or that it has been with such poison that Cæsar's antidote will not remedy it, so he may leave off the decoction.

During the cure, the patient must live on spare diet, and abstain from eating mutton, pork, butter, or any other fat or oily food.

N. B. The plantane or hoarhound will either of them cure alone, but they are most efficacious together.

In summer you may take one handful of the root and branches of each, instead of three ounces of the roots of each.

For drink during the cure, let them take the following:

Take of the roots of the golden rod, six ounces, or in summer, two large handsful of the roots and branches, and boil them in two quarts of water to one quart, to which also may be added, a little hoarhound and sassafras; to this decoction, after it is strained, add a glass of rum or brandy, and sweeten it with sugar for ordinary drink.

Sometimes an inward fever attends such as are poisoned, for which he ordered the following:

Take one pint of wood ashes and three pints of water, stir and mix them well together, let them stand all night and strain or decant the lye off in the morning, of which ten ounces may be taken six mornings following, warmed or cold according to the weather.

The symptoms attending such as are poisoned, are as follows:

A pain of the breast, difficulty of breathing, a load at the pit of the stomach, an irregular pulse, burning and violent pains of the viscera above and below the naval, very restless at night, sometimes wandering pains over the whole body, a reaching inclination to vomit, profuse sweats (which prove always serviceble) slimy stools, both when costive and loose, the face of a pale and yellow colour, sometimes a pain and inflamation of the throat, the appetite is generally weak, and some cannot eat any; those who have been long poisoned, are generally very feeble, and weak in their limbs, sometimes spit a great deal, the whole skin peels, and likewise the hair falls off.

IV. *Cæsar's cure for the bite of a Rattle-snake.*

Take of the roots of plantane or hoarhound, (in summer, roots and branches together), bruise them in a morter, and squeeze out the juice, of which, give as soon as possible one large spoonful; if the patient is swelled, you must force if down his throat, this will generally cure; but if he finds no relief in an hour, you may give another spoonfull, which never hath failed.

If the roots are dried, they must be moistend with a little water.

To the wound may be applied a leaf of good tobacco, moistened with a little rum.

V. *On the cultivation of the Poppy-plant, and the method of procuring opium.*

Opium is the produce of the papaver somniferum of Linnæus, which as a genus, comprehends two species, viz. 1. The double, 2. the single; each of which includes several varieties, as to the colour of the flowers, some being white, some red, others purple and varigated.

The poppy seeds, in this country should be sown or planted about the middle of May, in rich moist ground.

The ground should be formed into plats of about four feet broad. The seeds should be planted in rows about ten or twelve inches apart each way. Shallow holes, of an inch in depth, should be made in the rows, at the distance above mentioned; the seeds put in and covered over evenly: after which they are to remain till the plants are grown about four inches high, when they may be frequently watered and manured, especially, if the land is dry, and not fertile; the best manure is said to be a compost of dung, ashes, and nitrous earth.

The ground should be kept clear from weeds, which may be done with very little trouble, with a small hoe, especially if the poppies are planted in rows, as before directed.

This is all that is necessary to be said on the cultivation of the plant, I shall now describe the method of obtaining its juice, which when inspissated to a pilular consistance, is called opium.

The states of the plants, wherein they are found to yield the most juice, are just before, in the time of, and immediately after flowering. The method of procuring the juice is this; in a sunny day cut off the stalks about an inch below their flowers, and as soon as the juice appears, (which it does at first, equally well on the part of the stalk cut off, as on the part left standing) collect it with a small scoop or pen-knife, which last answers the purpose very well. After the juice ceases to appear on the top of the standing stalk, it should be cut off about an inch lower, and it will yield almost as freely as before; and this cutting off is repeated, as long as any juice appears.

The juice when collected, should be put into an evaporating pan, placed in the sun's heat, and frequently stirred till it becomes of a consistance to be formed into pills, or made into rolls for keeping, or transportation.

VI. *Receipt for the Whooping Cough.*

Take of dried colts-foot leaves, (that has not been gathered more than a year), a good handfull, cut them small, and boil them in a pint of spring water, till half a pint is boiled away; then take it off the fire, and when it is almost cold, strain it through a cloth, squeezing the herb as dry as you can, and then throw it away. Dissolve in the liquor, an ounce of brown sugar-candy, finely powdered, and to a child three or four years old, give one spoonful of it, cold or warm, as the season proves, three or four times a

day or oftener, if the fits of coughing come frequently, till well. For older or younger persons, the quantity may be increased, or decreased as may be thought proper.

This preparation is useful also in asthma's phthysic, shortness of breath, consumption's, &c.

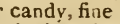
N. B. When sugar-candy cannot conveniently be had, perhaps honey or good clean brown sugar would answer; sugar-candy, is however to be preferred.

VII. *Receipt for curing weak and weeping Eyes.*

Make a strong decoction of cammomile boiled in sweet cows milk; with this let the patient eyes be bathed several times a day as warm as can be suffered without uneasiness. Persons almost blind, have been cured by persevering in the use of this prescription. It is proper however, to observe that frequently five or six weeks bathing of the eyes is necessary.

VIII. *A receipt for a Cold.*

Take a large spoonful of lintseed, four penny worth of stick licorice, and a half a pound of sun raisons. Put them into a gallon of soft water, and let it simmer over a slow fire, till it be reduced one half; then add to it half a pound of brown sugar candy, fine powdered. Drink half a pint of this at going to bed, adding thereto, a little white wine vinegar, or lemmon juice: this should be added to each quantity as you take it; not to the whole. A little of this may be taken, whenever the cough is troublesome. It is useful, even in the first stages of a consumption.



CHAP. XXI.

SECRETS ENTERTAINING AND USEFUL.

I. *To whiten Wax.*

Melt it in a pipkin without boiling. Then take a wooden pestle, which steep in the wax two fingers deep, and plunge immediately into cold water to loosen the wax from it, which will come off like sheets of paper. When you have got all your wax out of the pipkin and made into flakes, put it on a clean towel, and expose it in the air on the grass till it is white. Then melt it and strain it

through a muslin to take all the dirt out of it, if there be any.

II. *Another method of whitening Wax in large manufactories.*

1. Melt your wax in a large copper, such as brewing or washing coppers fixed in mortar; have a kind of trough, made of oak or deal, and six or seven feet long, at the farther end of which a cock of cold water will be placed in the wall to fill it, and at the other, towards the copper, a tub laid upon it, to receive the wax from the copper. Let that tub have also a cock at four fingers breadth from the bottom, and in that tub pour the melted hot wax from the copper. Cover it with a blanket in four doublets to make it retain its heat, and let it rest thus a couple of hours, to give time to the dirt and nastiness, which may happen to be in it, to settle at the bottom of the tub. When that is done, fill your trough with cold water; then have a kind of tin basket to fit the width of the trough so as to sit upon its edges, and bored at bottom with twelve or sixteen small holes, at equal distances, so as to receive the melted wax from the cock of the tub, and render it in the trough through the said small holes of its bottom, while with a polished wooden stick or roller, under the tub, and armed at both ends with iron in the form of a spit, and half of the thickness of which enters into the water, while the other keeps above it, you keep continually turning equally and regularly. This process will make the wax flake in the water into small ribbons as thin as silver paper. Now in fine clean hampers, or hand-baskets, made of white peeled willow twigs, take your wax from the trough with a wooden shovel, and carry it to an open field, where lay it thick upon a coarse cloth in the sun, and turn it every other day for two weeks running, after which time it will be of a very perfect whiteness.

2. Now clean well your copper, and put in alum-water to warm, in which throw your whitened wax, and stir well. When melted, renew the operation as before, and carry it again in the open field to expose it in the sun. In a week's time it will have its whiteness in the highest degree it can be carried to.

3. Melt then for the last time, and put in small round cakes, which is done by casting it in small moulds carved purposely on several boards.

III. *To make mutton suet candles, in imitation of wax candles.*

1. Throw quicklime in melted mutton suet; the lime will fall to the bottom, and carry along with it all the nastiness of the suet, so as to leave it as pure and fine as wax itself.

2. Now if with one part of that suet, you mix three of real wax, you will never be able to find out the mixture, not even in the moulding and casting wax for figures or ornaments.

IV. *To make soap.*

The white, or as it is called, the Genoa soap, is made with wood ashes, Alicant kali, lime and olive oil. The black is made of the same materials, with this exception, that it is made with the fæces and tartar of the oils. The marble is made with Alicant kali, bourde, and lime; and when it is almost done, they take some red earth, which they call cinnabar, with copperas; they boil these together and throw it in the copper where the soap is. It occasions a blue marbling, as long as the copperas keeps the better of the two ingredients; but as soon as the cinnabar has at last absorded the vitriol, this blue hue subsides entirely, and the red alone predominates. Therefore, to form the soap, make different lyes with all these sorts of matters, and when they are sufficiently charged (which beginners know by their carrying an egg swimming, without its sinking to the bottom, and experienced soap-boilers are judges of by dejustation, and the time they have been at work) they put all these lyes in proper coppers, and pour at the same time in Provence and Languedoc, oil of olive; in Germany, grease; and in England, oil of fish. Then boil all together with a great blasting fire; and eighteen or twenty days afterwards these oils have so well aspired all the salts of the lye, that this is left quite flat and untasty. Then by the cocks which are at the bottom of the coppers, the water or lye is let out and the lup of soap taken out and placed to dry in houses built on purpose to make it take a sufficient consistence.

V. *To prevent any thing from burning in the fire.*

Pound into powder cherry-tree gum and alum in equal quantities, and imbibe that powder with strong wine-vinegar, which leave thus a digesting on warm ashes, for the space of twenty four hours. If with this composition you rub any thing and throw it in the fire, it will not be consumed by it.

XII. *Fruit.*

To preserve trees from being injured by worms, caterpillars, &c. Clear away the gum that issues out of the tree affected by the worm; strew a little flour of brimstone around the root, and cover it with fine mould, that it may not be blown away, yet so that the sun may operate through and cause the brimstone to fumigate, which will destroy the worm. One pound of brimstone is sufficient for near two hundred trees. The same kind of sulphur is destructive to caterpillars. Split the end of a pole or stick, put therein a few brimstone matches, set them on fire, and hold the pole under the nest.

XIII. *To kill all sorts of worms in cattle.*

Take saven, chop it small, and beat it with fresh butter, make it in small balls, and give it to the beast in a proportionable quantity. Sweet wort and a little black soap mixed together as a drink, maketh all sorts of beasts void the worms.

XIV. *To kill maggots in sheep.*

Take goose grease, tar and brimstone, mix them together on the fire, and when cold anoint the troubled places therewith.

ON

DISTILLING.

(From the works of A. COOPER, *Distiller.)*

DISTILLATION is the art of seperating, or drawing off the spirituous, aqueous, and oleaginous parts a mixt body from the grosser, and more terrestrial parts, by means of fire, and condensing them again by cold.

CHAP. I.

OF THE DISTILLATION OF SPIRITS.

By the distillation of spirits is to be understood the art by which all imflammable spirits, brandies, rums, arracks, and the like, are procured from vegetable substances, by the means of a previous fermentation, and a subsequent treatment of the fermented liquor by the alembic, or hot still, with its proper worm and refrigeratory.

But as it is impossible to extract vinous spirits from any vegetable subject without fermentation ; and previous to this. Brewing is often necessary, it will be requisite first to consider these operations.

ARTICLE I.

Of Brewing, in order to the Production of inflammable Spirits.

By Brewing, we mean the extracting a tincture from some vegetable substance, or dissolving it in hot water, by which means it becomes proper for a vinous fermentation.

A solution, or fermentable tincture of this kind, may be procured, with proper management, from any vegetable substance, but the more readily and totally it dissolves in the fluid, the better it is fitted for fermentation, and the larger its produce of spirits. All inspissated vegetable juices, therefore, as sugar, honey, treacle, manna, &c. are very proper for this use, as they totally dissolve in water, forming a clear and uniform solution : but malt, for its cheapness, is generally preferred in England, though it but imperfectly dissolves in hot water. The worst sort is

commonly chosen for this purpose ; and the tincture, without the addition of hops, or trouble of boiling it, is directly cooled and fermented.

But in order to brew with malt to the greatest advantage, the three following particulars should be carefully attended to: First, The subject should be well prepared; that is, it should be justly malted, and well ground: for if it be too little malted, it will prove hard and flinty ; and consequently, only a small part of it dissolve in the water: and, on the other hand if too much malted, a great part of the finer particles, or fermentable matter, will be lost in the operation. With regard to grinding, the malt should be reduced to a kind of coarse meal ; for experience has shewn, that by this means, the whole substance of the malt may, through the whole process, continue mixed with the tincture, and be distilled with it ; whereby a larger quantity of spirit will be obtained, and also great part of the trouble, time, and expence, in brewing saved. This secret depends upon thoroughly mixing, or briskly agitating the meal, first in cold water, and then in hot ; and repeating this agitation after the fermentation is finished ; when the thick turbid wash must be immediately committed to the still. And thus the two operations of Brewing and Fermenting may very commodiously be reduced to one, to the no small profit and advantage of the distiller.

The second particular to be attended to, is, that the water be good, and properly applied. Rain water is the best adapted to Brewing ; for it not only extracts the tincture of the malt better than any other, but it also abounds in fermentable parts, whereby the operation is quickened and the yield of the spirit increased. The next to that of rain is the water of rivers and lakes, particularly such as wash any large tract of a fertile country, or receive the sullage of populous towns. But whatever water is used, it must stand in a hot state upon the prepared malt, especially if a clear tincture be desired ; but the greatest care must be taken to prevent the malt from running into lumps or clods ; and, indeed, the best way to prevent this is to put a small quantity of cold water to the malt first, and mix them well together, after which the remaining quantity of water may be added in a state of boiling, without the least danger of coagulating the malt, or, what the distillers call, making a pudding.

It has been found by experience, that a certain degree of heat is necessary to extract the whole virtue of the malt; this degree may, by the above method, be determined to the greatest exactness, as the heat of boiling water may at once be lessened to any assigned degree of warmth, by a proper addition of cold water ; due regard being had

to the season of the year, and the temperature of the air. This improvement, with that mentioned above, of reducing the two operations of Brewing and Fermentation to one, will be attended with considerable advantage.

With regard to the proper quantity of water, it must be observed, that if too little be used, a viscid clammy mixture will be produced, little disposed, to ferment, nor capable of extracting all the soluble parts of the malt. On the other hand, too much water renders the tincture thin and aqueous, and by that means increases the trouble and expence in all parts of the operation. A due medium, therefore, should be chosen; and experience has shewn, that a wash about the goodness of that designed by the London brewers for ten shilling beer, will best answer the distiller's purpose. When a proper quantity of water is mixed with the malt, the whole mass must be well agitated that all the soluble parts of the malt may often come in contact with the aqueous fluid, which being well saturated after standing a proper time, must be drawn off, fresh water poured on, and the agitations repeated, till the whole virtue, or saccharine sweetness of the malt is extracted, and only a fixed husky matter remains, incapable of being dissolved by either hot or cold water.

The third requisite particular is, that some certain additions be used, or alterations made according to the season of the year, or the intention of the operator. The season of the year is very necessary to be considered. In the summer, the water applied to the malt must be colder than in the winter; and, in hot sultry weather, the tincture must be suddenly cooled, otherwise it will turn eager; and in order to check the too great tendency it has to fermentation, when the air is hot, it will be necessary to add a proper quantity or unmalted meal, which being much less disposed to fermentation than malt, will greatly moderate its impetuosity, and render the operation suitable to the production of spirits, which by a too violent fermentation, would in a great measure be dissipated, and lost.

Article II.

Of Fermentation.

The tincture, or, as the distillers call it, the wash being prepared as in the foregoing article, it is next to be fermented; for without this operation, no vinous spirit can be produced.

By fermentation is meant that intestine motion performed by the instrumental efficacy of water, whereby the

salt, oil and earth of a fermentable subject, are separated, attenuated, transposed, and again collected, and recomposed in a particular manner.

The doctrine of fermentation, is of the greatest use, and should be well understood by every distiller, as it is the very basis of the art; and, perhaps, if more attended to, a much purer spirit, as well as a greater quantity of it, might be procured from the same materials than at present We shall therefore lay down a concise theory of fermentation, before we proceed to deliver the practice.

Every fermentable subject is composed of salt, oil, and a subtle earth; but these particles are so small, that, when asunder, they are imperceptible to the senses; and, therefore, when mixed with an aqueous fluid, they leave it transparent; neither have fermentable bodies any taste, except that of sweetness.

These particles are each composed of salt, oil and earth, intimately mixed in an actual cohesion, connexion, and union; and, therefore, when any one of those principles too much abounds in any subject, so that an intimate union is prevented, the whole efficacy of the fermentation is either stopped or impaired, or at least limited to one certain species.

This equal connexion of salt, oil, and earth, into a single compound particle, forms a corpuscle soluble in water; or to speak more philosophically, this compound corpuscle is, by mean of its saline particles, connected with the aqueous corpuscles, and moved up and down with them. But where these corpuscles are not thus connected with the water, a number of them join together, and from either a gross, or a loose chaffy, and spungy matter.

When these compound particles are diluted with a small quantity of an aqueous fluid, they feel slippery, clammy, and unctuous to the touch, and effect the taste with a kind of ropy sweetness. And when a proper quantity of the fluid is added, a commotion is presently excited, and afterwards a subtle separation.

This commotion and separation first begins in the whole substance; for before the addition of water, the subject may remain in dry, solid, and large pieces, as in malt, sugar, &c. which being reduced to powder, each grain thereof is an agreement of many smaller compound corpuscles; these being put into water dissolve, and separately float therein, till at length, they become so small as to be invisible, and only thicken the consistance of the liquor.

These corpuscles being thus separated from one another, there next ensues a separation of their component particles; that is, the salt, the oil, and the earth, are divided by the interposition of the aqueous particles.

The first commotion is no more than a bare solution; for the saline particles being easily dissolvable in water, they are immediately laid hold of by the aqueous particles, and carried about with them. But the succeeding separation, or fermentative motion, is a very different thing: for by this the saline particles are divided from those of oil and earth, partly by the impulse of the others in their motion, and partly by the force of the aqueous particles, which are now continually meeting and dashing against them.

This motion is performed by the water, as a fluid, or aggregate of an infinite number of particles, in actual and perpetual motion; their smallness being proportionable to that of the fermenting corpuscles, and their motion, or constant susceptibility of motion, by warmth, and the motion of the air, disposing them to move other subtle moveable corpuscles also. The certain agreement of figure, or size, between the aqueous particles, and those of the salt in the fermentable subject, tends greatly to increase this commotion; for by this means, they are readily and very closely connected together; and therefore move almost like one and the same compound corpuscle; whilst the water is not at all disposed to cohere immediately with either the oil or earth. And thus an unequal concussion is excited in the compound corpuscles of the fermentable subject; which concussion at length strikes out the saline particle, loosens the others, and finally produces a separation of the original connexion of the subject.

An aqueous fluid, therefore, is the true, and indeed, the only instrument for procuring a fermentable motion in these compound corpuscles of the subject; for were an oily fluid poured upon any fermentable subject, no vinous fermentation would ensue; as the oil could neither give a sufficient impulse on the compound corpuscles, which are grosser than its own constituent particles, nor divide the oily or saline particles of the subject from their connexion with the others, which detain, and, as it were, envelope or defend them from its action.

The compound corpuscles of the fermentable subject being affected by the perpetual motion of the particles of the aqueous fluid, a proper degree of motion is necessary, or that the particles move with a proper degree of velocity, which principally depends on external heat. A considerable degree of cold, indeed, will not absolutely prevent fermentation, though it will greatly retard it; and a boiling heat will prevent it still more. A tepid, or middle degree of heat between freezing or boiling, is therefore the most proper for promoting and quickening the operation.

The admission of air, also though not of absolute neces-

sity, yet greatly promotes and quickens the action, as being a capital instrument in putting in a proper degree of motion, the oily particles of the subject. But whilst the air thus contributes to hasten the effect, it causes at the same time by its activity some remarkable alterations in the oily particles; for it not only moves, but absolutely dissolves and displaces them from their original connexions; and thus carries them off itself from the whole mass. And, therefore, though the consideration of the air does not so properly belong to fermentation in the general, yet it does in particular; as having an accidental power to alter every species of this operation; consequently its agency ought to be well understood, either to procure alterations at pleasure in the fermenting mass, or to prevent and correct impending dangers.

The oily particles thus separated and dissolved by the air, are also elastic, though they probably derive that property from their intercourse with the air itself, and there being rendered extremely minute.

When, therefore, an aqueous fluid is added to a fermentable subject, exposed to a temporate heat, a fermentative struggle immediately arises, the saline part of the compound particles being dissolved by the continual intestine motion of the water, and carried up and down with it in all directions, amidst an infinite number of other particles, as well fermentable as aqueous ones; whence by this collision and attrition, the saline particles are dissolved, and separated from their connexion with the oily and earthy. And as the oily particles are the most subtle and elastic, they would, by this means, be thrown up to the surface of the liquor, and carried off by the air, were they not closely connected with the earthy ones, whose gravity prevents their evaporation, and, by coming in contact with others of the same kind, form aggregations, and sink down with the oily particles, to the bottom. But before these can form a bulk too large to be supported by the water, many of the oily particles are, by their frequent collisions with the aqueous fluid, separated from the earthy ones; and by degrees more strongly connected again with the saline ones: whilst, on the other hand, the same saline particles imbibe some of the earthy ones, which being left single, upon their separation from the oily particles, floated about separately in the fluid.

And hence proceed the several different consequences of fermentation; viz. 1. From the separation of the saline particles of the fermentable subject proceeds the tart, saline, or acid taste of the liquor; which is more sensible at first, before the liquor is duly composed and settled, or the due arrangement and connexion of the saline particles with

those of the oily and earthy kinds, completed; after which the liquor proves milder, softer, or less pungent. 2. From the oily particles being set at liberty, proceeds the strong smell of the liquor, and the head or shining skin upon the surface. 3. The earthy particles collecting together in clusters, cause the fluid to appear turbid, and afterwards a visible earthy, or clay-like matter to be precipitated: and some of the earthy, parts, in their motion, arriving at the head or oily skin on the surface, cause it to thicken; and afterwards taking it down along with it, thus constitute the lees which abound in oil. 4. From this new struggle or collision, which is productive both of solution and a new connexion in this saline and earthy corpuscles, proceeds the ebullition in fermentation. And, lastly, by the same repeated coalition of the oily with the aqueous and saline particles the inflammable spirit is produced.

Having thus laid down a concise theory of fermentation, we shall now proceed to the practice.

The wash being brought to a tepid, or luke-warm state in the backs, a proper quantity of a good conditioned ferment is added; but if the ferment be soiled, it should be previously broke into small pieces, and gently thinned either with the hand, wisp, &c. in a little of the tepid liquor. A complete and uniform solution, however, should not be attempted, because that would greatly weaken the power of the ferment, or destroy its future efficacy. The whole intended quantity, therefore, being thus loosely mixed with a moderate parcel of the liquor, and kept in a tepid state, either by setting it near the fire or otherwise, and free from the too rude commerce of the external air; more of the insensibly warm liquor ought to be added, at proper intervals, till at length, the whole quantity is properly set to working together. And thus, by dividing the business into parts, it may much more speedily and effectually be performed, than by attempting it all at once.

The whole quantity of liquor being thus set to work, secured in a proper degree of warmth, and defended from a too free intercourse of the external air, nature itself as it were, finishes the process, and renders the liquor fit for the still.

By ferments, we mean any substance, which being added to any rightly disposed fermentable liquor, will cause it to ferment much sooner and faster than it would of itself; and, consequently, render the operation shorter; in contradiction to those abusively called so, which only correct some fault in the liquor, or give it some flavor. Hence we see, that the principal use of ferments is to save time, and make dispatch in business; whilst they only occasionally, and, as it were by accident, gave a flavor, and in-

crease the quantity of spirit. And, accordingly, any fermentable liquor, may, without the addition of any ferment by a proper management of heat alone, be brought to ferment, and even more perfectly, though much slower, than with their assistance.

These ferments are, in general, the flowers and fæces of all fermentable liquors, generated and thrown to the surface, or deposited at the bottom, either during the act of fermentation, or after the operation is finished.

Two of these are procurable in large quantities, and at a small expence; we mean beer-yeast and wine-lees; a prudent and artificial management, or use of which, might render the business of distillation much more facile certain and advantageous.

It has been esteemed very difficult, and a great discouragement in the business of distillation, to procure a sufficient stock of these materials, and preserve them at all times ready for use. The whole secret consists in dexterously freeing the matter from its superfluous moisture; because in its fluid state, it is subject to a farther fermentation, which is productive of corruption; in which state it becomes intolerably fœtid and cadaverous.

The method of exposing it to the air till it has required a proper consistence is subject to great inconveniences; and so peculiar and careful a management necessary, that it rarely succeeds.

The best way, therefore, is to press it very slowly and gradually, in a thick, close, and strong canvas bag, after the manner of wine-lees, by the tail press, till it becomes a kind of cake; which, though soft, will easily snap or break dry and brittle between the fingers. Being reduced to that consistence, and closely packed up in a tight cask it will remain a long time uncorrupted, preserve its fragrancy, and consequently fit to be used for fermenting the finest liquor.

The same method is also practicable, and to the same advantage, in the flowers or yeast of wine, which may be thus commodiously imported from abroad: or, if these cannot be procured, others of equal efficacy may be procured from fresh wine-lees, by barely mixing and stirring them into a proper warm liquor, whence the lighter or more volatile and active parts of the lees will be thrown to the surface and may easily be taken off and preserved, by the above-mentioned method, in any desired quantity. And hence, by a very easy process, an inexhaustable supply of the most useful ferments may be readily and successively procured, so as to prevent for the future all occasion of complaint for want of them, in the distiller's business.

Experience has demonstrated, that all ferments abound

much more in essential oil, than the liquor which produced them: and consequently they retain, in a very high degree, the smell and flavour of the subject. It is therefore requisite, before the ferment is applied, to consider what flavor is intended to be introduced, or what species of ferment is most proper for the liquor.

The alteration thus caused by ferments is so considerable, as to render any neutral fermentable liquor of the same flavor with that which yielded the ferment. This observation is of much greater moment than will presently be conceived, for a new scene is hereby opened, both in the business of distillation, and others depending upon fermentation It must, however, be observed, that its benefit does not extend to malt, treated in the common method; nor to any other subject but what affords a spirit tolerably pure and tasteless. For otherwise, instead of producing a simple, pure and uniform flavor, it causes a compound, mixed and unnatural one. How far the fine stiller may profit by it, well deserves his attention; and whether our native cyder spirit, crab spirit, &c. which have very little flavor of their own, may not, by this artifice, be brought nearly, if not entirely, into the state of some foreign brandies, so highly esteemed, is recommended to experience.

It is common with distillers, in order to increase the quantity of spirit, to give it a particular flavor, to improve its vinosity, to add several things to the liquor during the time it is in a state of fermentation; and these additions may properly be reduced to salts, acids, aromatics and oils.

All rich vegetable juices, as treacle, honey, &c. which either want a natural acid, have been deprived of it, or contain it in too small a quantity, will be greatly improved by adding at the beginning of the operation, a small quantity of the vegetable or fine mineral acids; as oil of sulphur, Glauber's spirit of salt, juice of lemons, or an aqueous solution of tartar These additions will either give, or greatly improve the vinous acidity of the subject, but not increase the quantity of the spirit, that intention being performed by aromatics and oils.

All pungent aromatics have a surprising quality of increasing the quantity of the spirit as well as in altering or improving the flavor; but their use requires that the fermentation should be performed in close vessels. And if a large quantity be intended to be added, care must be taken not to do it all at once, lest the oiliness of the ingredien- should check the operation. But if the flavor be the principal intention, they should not be added till the operation is nearly finished. After the same manner a very considerable quantity of any essential vegetable oil may

be converted into a surprisingly large quantity of inflammable spirit: but great caution is here also necessary not to drop it too fast, or add too large a quantity at a time, which would damp the fermentation; it being the surest method of checking or totally stopping this operation at any point of time required. The best method, therefore, of adding the oil so as to avoid all inconveniences, is to rub the oil in a mortar with sugar, which the chemists call making an *Oleosaccharum*, by which means the tenacity of the oil will be destroyed, and the whole readily mix with the liquor and immediately ferment with it. The distiller would do well to consider these observations attentively, as he may thence form an advantageous method of increasing the quantity of spirits, and at the same time greatly improve their quality and flavor.

But in order to put these observations in practice, particular regard must be had to the containing vessel in which the fermentation is performed, the exclusion of the air, and the degree of the external heat or cold.

With regard to the containing vessel; its purity, and the provision for rendering it occasionally close, are chiefly to be considered. In cleansing it, no soap, or other unctuous body should be used, for fear of checking the fermentation; and, for the same reason, all strong alkaline lixiviums should be avoided. Lime-water, or a turbid solution of quick-lime may be employed for this purpose, without producing any ill-effect; it will also be of great service in destroying a prevailing acetous salt, which is apt to generate in the vessels when the warm air has free access to them; and tends to prevent the order of fermentation, and instead of a wine or wash, produce a vinegar. Special care must also be had, that no remains of yeast, or cadaverous remains of former fermented matters, hang about the vessels, which would infect whatever should be afterwards put into them; and cannot, without the utmost difficulty, be perfectly cured and sweetened.

The occasional closeness of the vessels may, in the large way, be provided for by covers properly adapted; and, in the small way, by valves, placed in light casks. These valves will occasionally give the necessary vent to preserve the vessel, during the height of the fermentation; the vessel otherwise remaining perfectly close, and impervious to the air.

It is a mistake of a very prejudicial nature, in the business of fermentation, to suppose, that there is an absolute necessity for a free admission of the external air. The express contrary is the truth, and very great advantages will be found by practising according to this supposition. A constant influx of the external air, if it does not carry off some part of the spirit already generated, yet certainly

catches up and dissipates the fine, subtle, or oleaginous and saline particles, whereof the spirit is made, and thus considerably lessens the quantity. By a close fermentation this inconveniency is avoided; all air, except that included in the vessel, being excluded. The whole secret consists in leaving a moderate space for the air at the top of the vessel, unpossessed by the liquor. When the liquor is once fairly at work to bung it down close, and thus suffer to finish the fermentation, without opening or giving it any more vent than that afforded it by a proper valve placed in the cask; which, however, is not of absolute necessity, when the empty space, or rather that possessed by the air, is about one tenth of the gage; the artificial air, generated in the operation being then seldom sufficient to open a strong valve, or at most not to endanger the cask.

This method may be practised to good advantage by those whose business is not very large; but it requires too much time to be used by the large dealers, who are in a manner forced to admit the free air, and thus sustain a considerable loss in their quantity of spirit, that the fermentation may be finished in the small time allowed for that purpose. It may, however, be said, that the silent, slow, and almost imperceptible vinous fermentation, is universally the most perfect and advantageous.

During the whole course of this operation, the vessel should be kept from all external cold, or considerable heat, in an equal, uniform and moderate temperature. In the winter, a stove room, such as is common in Germany, would be very convenient for this purpose; the vessel being placed at a proper distance from the stove: but at other seasons no particular apparatus is necessary with us in England, if the place allotted for the business be but well defended from the summer's heat, and the ill effects of cold bleak northern winds.

The operation is known to be perfected when the hissing, or small bubbling noise can be no longer heard, upon applying the ear to the vessel; and also by the liquor itself appearing clear to the eye, and having a pungent sharpness on the tongue. And that it may fully obtain these properties, and be well fitted to yield a pure and perfectly vinous spirit by distillation, it should be suffered, to stand at rest in a somewhat cooler place, if practicable, than that in which it was fermented; till it has throughly deposited and cleansed itself of the gross lee, and become perfectly transparent, vinous and fragrant; in which state it should be committed to the still, and the spirit obtained will not only exceed that obtained in the common way in quantity, but also in fragrance, pungency, and vinosity.

Article III.

Of Distillation in general.

Having in the two preceding articles laid down the best methods of brewing and fermentation, we shall now proceed to the method of distillation.

And in order to lead our readers methodically through the path which lies before them, we shall begin with explaining the principles of distillation; or, the method of extracting the spirituous parts of bodies.

To extract the spirits is to cause such an action by heat, as to cause them to ascend in vapour from the bodies which detain them.

If this heat be natural to bodies, so that the separation be made without any adventitious means, it is called fermentation, which we have already explained.

If it be produced by fire, or other heating power, in which the alembic is placed, it is called digestion, or distillation; digestion, if the heat only prepares the materials for the distillation of their spirits; and distillation, where the action is of sufficient efficacy to cause them to ascend in vapour, and distil

This heat is that which puts the insensible parts of a body, whatever it be, into motion, divides them, and causes a passage for the spirits inclosed herein, by disengaging them from the phlegm, and the earthy particles by which they are inclosed.

Distillation considered in this light, is not unworthy the attention and countenance of the learned. This art is of infinite extent; whatever the whole earth produces, flowers, fruits, seeds, spices, aromatic and vulnerary plants, odoriferous, drugs, &c. are its objects, and come under its cognizance; but we generally confine it to liquids of taste and smell; and to the simple and spirituous waters of aromatic and vulnerary plants With regard to its utility, we shall omit saying any thing here, as we shall give sufficient proofs of it in the sequel.

Article IV.

Of Bodies proper for Distillation.

This article alone might make a volume, were we to make a particular enumeration of all its parts; but, as we have already observed, we shall confine ourselves to the distillation of simple and compound waters.

If we acquit ourselves to the satisfaction of the public, we shall enjoy the pleasure of having treated of one part,

entirely new; and, indeed, the only one that has been overlooked.

The bodies proper for distillation, are flowers, fruits, seeds, spices, and aromatic plants.

By distillation and digestion, we extract the colour and smell of flowers, in simple waters and essences.

We extract from fruits, at least from some, colour, taste, &c.

From aromatic plants, the distiller draws spirits, essences, simple, and compound waters.

From spices are procured essences, or, in the language of the chemists, oils and perfumes, and also pure spirits.

From seeds, or berries, are drawn simple waters, pure spirits, and from some, as those of annise, fennel, and juniper, oil.

The colour of flowers is extracted by infusion, and likewise by digestion in brandy or spirit of wine; the smell is extracted by distillation; the simple water with brandy, or spirit of wine.

What is extracted of the colour of flowers, by infusion in water by a gentle heat, or by digestion in brandy, or spirits of wine, is called in the distiller's phrase, tincture of flowers.

The colour of fruits is extracted in the same manner, either by infusion or digestion; their taste is also procured by the same processes But let it be observed, that the time of these operations must be limited; for otherwise the fruit, after fermentation, would render it acid. The taste is also extracted by distillation in spirit of wine.

From aromatic plants, are extracted by the alembic, pure spirits, odours, and simple waters But these require different methods of distillation. The first by water, or brandy only, the second by rectified spirit which will give them the greatest excellency they are capable of

The plants themselves with their flowers may also be distilled, which is still better.

From spices are drawn spirits, and oily, or spirituous quintessences. The spirits are drawn by brandy, or spirit of wine, with very little water; the oils are distilled *per descensum*; and the spirituous quintessences by pounding the spices, and after infusing them in spirit of wine, decanting it gently by inclination.

From seeds are extracted simple waters, spirits, and oils. Very few of the first and last spirits being what is generally extracted from seeds and berries.

Some distillers, through a notion of frugality, distil seeds with water; but their liquors are not to be compared with those which are distilled with spirits. When oils are

drawn from seed, the operation is performed either by the *Balneum Mariæ*, or the vapour-bath.

We only deliver in this place, the first elements of each of these operations, which will be further illustrated in the sequel when we treat more particularly of these subjects.

Article V.

Of what is procured by Distillation.

By Distillation are procured spirit, essence, simple waters, and phlegm.

Spirits are very difficult to be defined I consider them as the most subtle and volatile parts of a body.

All bodies without exception have spirits more or less.

These parts are an ignited substance, and consequently by their own nature disposed to a violent motion

These volatile particles are more or less disposed to separate themselves, as the bodies are more or less porous, or abound with a greater or lesser quantity of oil.

By the term essence, we understand the oleaginous parts of a body. An essential oil is found in all bodies, being one of their constituent principles. I have observed in all distillations, spirit of wine excepted, a soft unctuous substance floating on the phlegm ; and this substance is oil, which we call essence, and this is what we endeavour to extract

Simple waters are those distilled from plants, flowers, &c. without the help of water, brandy, or spirit of wine. These waters are commonly odoriferous, containing the odour of the body from whence it is extracted, and even exceeds in smell the body itself.

Phlegm is the aqueous particles of bodies, but whether an active or passive principle, we shall leave to the decision of chemists.

It is of the last importance to a distiller to be well acquainted with its nature ; many mistaking for phlegm several white and clouded drops, which first fall into the receiver, when the still begins to work. These, however, are often the most spirituous particles of the matter in the alembic, and consequently ought to be preserved. What has given occasion to this mistake, is some humidity remaining in the head, &c. of the alembic. And had it been thoroughly wiped, the first drops would have been equally bright with any during the whole operation.

The following remark deserves attention. In bodies that have been digested, the spirits ascend first ; whereas in charges not digested the phlegm ascends before the spirits. The reason of this is very plain and natural.

In substances previously digested, the action of the fire no sooner causes the matter in the alembic to boil, than the spirits, being the most volatile parts, detach themselves and ascend into the head of the alembic. But when the matter to be distilled has not undergone a proper digestion, the spirits being entangled in the phlegm, are less disposed to ascend till the phlegm itself separates and gives them room to fly upwards

The phlegm being aqueous rises first: this is more particularly observable in spices. I am, however, inclined to believe, that were the operation performed in an alembic, whose head was at a great distance from the surface of the charge. they would not ascend high enough to come over the helm, but fall back again by their own gravity, and by that means leave the spirits at liberty to ascend. But in the common refrigeratory alembic this always happens.

If this observation be not readily admitted, I appeal to experience, which I desire may be the test of every thing I shall advance.

Another observation, which has verified the above assertion by innumerable instances, is, that in an extraordinary run of business, when I had not time sufficient to digest the substances, I used to bruise them in a mortar; but notwithstanding the trituration the phlegm first came over and afterwards the spirits. But I desire to be understood, that I speak here only of the volatile parts of the plants not drawn with vinous spirits, but contained in a simple water.

Another remark I must add, and which I hope will be acceptable to the curious, as it has not yet been made public, though doubtless the observation has often occurred to others; it is this: that in mixed charges, consisting of flowers, fruits, and aromatic plants, put into the alembic without a previous digestion, the spirits of the flowers ascend first; and notwithstanding the mixture, they contracted nothing of the smell or taste of the fruits and plants. Next after the spirits of the flowers, those of the fruits ascend, not in the least impregnated with the smell or taste of either of the flowers or plants. And in the last place, the spirits of the plants distil no less neat than the former. Should this appear strange to any one, experience will convince him of the truth.

Another observation I have made on aromatic herbs, is, that whether they are or are not digested, whether the spirits or phlegm ascend first, the spirits contain very little of the taste and smell of the plants from whence they were extracted; and I have always been obliged to put to these spirits a greater or lesser quantity of the phlegm,

in order to give the spirits I had drawn the taste of an aromatic odour of the plants, the phlegm containing the greatest quantity of both.

This observation I insert as of a great use to those who practice distillation.

As the term digestion often occurs in this essay, I cannot avoid pointing out its advantages, and even shew the necessity of using it in several circumstances.

Substances are said to be in digestion when they are infused in a menstruum over a very slow fire. This preparation is often necessary in distillation, for it tends to open the bodies, and thereby free the spirits from their confinements, whereby they are better enabled to ascend.

Cold digestions are the best; those made by fire, or in hot materials, diminish the quality of the goods, or some part, as the most volatile, will be lost

In order to procure essences, the bodies must be prepared by digestion. It is even of absolute necessity for extracting the spirits and essences of spices.

Article VI.

Of the proper Season for Distilling.

Flowers of all kinds must be distilled in their proper seasons. To begin with the violet. Its colour and smell can only be extracted when it is in its greatest vigour, which is not at its first appearance, nor when it begins to decay. *April* is the month in which it is in its greatest perfection; the season being never so forward in *March*, as to give the violet its whole fragrancy.

The same must be observed of all other flowers. And let them be gathered at the hottest time of the day; the odour and fragrancy of flowers being then in their greatest perfection.

The same observation holds good with regard to fruits; to which must be added, that they are the finest, and of the most beautiful colour, especially those from whence tinctures are drawn; they must be free from all defects, as the goods would by that means be greatly detrimented.

Berries and aromatics may be distilled at any season, all that is necessary being a good choice. But in this distillers are sometimes mistaken, as may easily happen without a very accurate knowledge. We shall therefore, in the sequel, lay down more particular directions for making a proper choice of materials.

Article VII.

Of the Filtration of Liquors

Filtration consists in passing liquors through some po-

rous substance, in order to free them from those particles which obscure their brightness.

Nothing is finer than a liquor newly distilled; but the syrup and colouring particles render it thick and opaque: in order therefore to restore their brightness, they are filtrated which is done by passing them through sand, paper, cloth, &c.

All the attention of the distiller cannot, in ordinary operations, alway prevent some aqueous particles from rising with the spirits, either in the beginning of the process, in those compositions where they ascend first or at the conclusion when they rise last. As this is almost unavoidable, so it is also sometimes necessary.

In distilling flowers, or aromatic plants, fresh gathered, the phlegm rises first; and this part cannot be taken out of the receiver, without depriving the spirits of a considerable part of their fragrancy.

In distilling spices, their odour being more entangled, will remain in the alembic, till part of the phlegm is drawn off But when instead of these substances, their quintessences are used, the necessity ceases. But the phlegm commonly causing a cloudiness in the liquor, it may be rendered tolerably fine, by pouring it gently off by inclination, without the trouble of filtration; the aqueous particles, by their gravity, falling to the bottom. But to render, it entirely bright and fine, put some cotton in a funnel, and pour the liquor through it, by which means the aqueous particles will be retained in the cotton. You must however remember to cover the top of the funnel, to prevent the most volatile parts of the spirits from evaporating.

Article VIII.

Of the Distillation of Malt Spirits.

The wash, or liquor, being prepared by brewing and fermentation, as directed in the first and second articles of this treatise, the still is to be charged with it, and worked off with a pretty brisk fire. But it should be observed, that the only apparatus, used in this process, is the alembic with a refrigeratory.

The wash being of a mucilaginous nature, a particular management is necessary to prevent its burning, and cause it to work kindly in the still: if it should happen to be burnt in the operation, the spirit will have a most disagreeable flavor, which can hardly ever be removed; and therefore to prevent this ill effect, the wash should be made dilute or thin, the fire well regulated, and the whole kept in a continual agitation during the whole process. The most judicious distillers always take care to have their

wash sufficiently diluted, and constantly find their spirit the purer for it. With regard to the fire, it may be easily kept regular, by a constant attendance, and observing never to stir it hastily, or throw on fresh fuel; and the stirring of the liquor in the still is to be effected by means of a paddle, or bar kept in the liquor, till it just begins to boil, which is the time for luting on the head; and after which there is no great danger, but from the improper management of the fire: this is the common way; but it is no easy matter to hit the exact time, and the doing it either too late, or too soon, is attended with great inconvenience, so that several have discovered other methods; some put more solid bodies into the still with the wash; others place some proper matter at the bottom and sides of the still, which are the places where the fire acts with the greatest force.

The use of the paddle, would, however, answer better than either of these methods could it be continued during the whole time the still is working; and this may be done by the following method: let a short tube of iron or copper be soldered in the centre of the still-head, and let a cross bar be placed below in the same head, with a hole in the middle, corresponding to that at the top; through both these, let an iron pipe be carried down in the still, and let an iron rod be passed through this with wooden sweeps at its end; this rod may be continually worked by a winch at the still-head, and the sweeps will continually keep the bottom and sides scraped clean, the interstices of the tube being all the time well crammed with tow, to prevent any evaporation of the spirit.

The same effect may in a great measure, be produced by a less laborious method, namely, by placing a parcel of cylindrical sticks lengthways, so as to cover the whole bottom of the still, or by throwing in a loose parcel of faggot sticks at a venture; for the action of the fire below moving the liquor, at the same time gives motion to the sticks, making them act continually like a parcel of stirrers upon the bottom and sides of the still, which might, if necessary be furnished with buttons and loops, to prevent them from starting. Some also use a parcel of fine hay laid upon the loose sticks, and secured down by two cross poles, laid from side to side, and in the same manner fastened down with loops. Care is to be taken in this case, not to press the hay against the sides of the still; for that would scorch nearly as soon as the wash itself; but the sticks never will: these are simple but effectual contrivances, and in point of elegance, they may be improved at pleasure.

There is another inconvenience attending the distilling of malt spirit, which is, when all the bottoms, or gross

mealy fœculence is put into the still along with the liquor, the thinner part of the wash going off in form of spirit; the mealy mass grows by degrees more and more stiff so as to scorch towards the latter part of the operation. The best method of remedying this, is to have a pipe with a stop-cock, leading from the upper part of the worm-tub into the still; so that upon a half, or a quarter turn, it may continually supply a little stream of hot water, in the same proportion as the spirit runs off, by which means the danger of scorching is avoided and the operation, at the same time, not in the least retarded.

In *Holland*, the malt distillers work all their wash thick, with the whole body of meal among it; yet they are so careful in keeping their stills clean, and so regular and nice in the management of their fires, that though they use no artifice at all on this head, only to charge the still while it is hot and moist, they very rarely have the misfortune to scorch, except now and then in the depth of winter. When such an accident has once happened in a still, they are extremely careful to scrape, scrub, and scour off the remains of the burnt matter, otherwise they find the same accident very liable to happen again in the same place. But beyond all the other methods in use on this occasion, would be the working the stills, not by a dry heat, but in a *Balneum Mariæ*, which might possibly be so contrived by the bason being large, and capable of working a great many stills at once, as to be extremely worth the proprietor's while in all respects.

Another requisite to be observed is, that the water in the worm-tub be kept cool; this may be effected, by placing in the middle of the tub a wooden pipe or gutter, about three inches square within, reaching from the top almost to the bottom; by this contrivance cold water may, as often as necessary, be conveyed to the bottom of the worm tub, and the hot water at the top forced either over the sides of the tub, or, which is better, through a ledden pipe of moderate size, called a waste-pipe, soldered into the top of the tub, and extended to the gutter formed to carry away the water.

Article IX.

Of the Distillation of Molasses-Spirits.

The spirit distilled from molasses or treacle, is very clean or pure. It is made from common treacle dissolved in water, and fermented in the same manner as the wash for the common malt spirit.

But if some particular art is not used in distilling this spirit, it will not prove so vinous as malt spirit, but more flat and

less pungent and acid, though otherwise much cleaner tasted, as its essential oil is of a less offensive flavor. Therefore, if good fresh wine-lees, abounding in tartar, be added and duly fermented with the molasses, the spirit will acquire a much greater vinosity and briskness, and approach much nearer to the nature of foreign spirits.

Where the molasses, spirit is brought to the common proof strength, if it be found not to have a sufficient vinosity, it will be very proper to add some good dulcified spirit of nitre 1 and if the spirit be clean worked, it may by this addition only, be made to pass on ordinary judges for *French* brandy.

Great quantities of this spirit are used in adulterating foreign brandy, rum and arrac. Much of it is also used alone in making cherry-brandy, and other drams by infusion; in all which, many, and perhaps with justice, prefer it to foreign brandies.

Molasses, like other spirits, is entirely colourless when first extracted; but distillers, always give it, as nearly as possible, the colour of foreign spirits; the methods of performing which we shall explain in a subsequent article.

Article X.

Of the Nature of Brandies, and Method of Distilling them in France.

The general method of distilling brandies in *France* need not be formally described, as it differs in nothing from that commonly practised here in working from wash or molasses, nor are they in the least more cleanly or exact in the operation.

They only observe more particularly to throw a little of the natural lee into the still along with the wine, as finding this gives their spirit the flavor for which it is generally admired abroad.

But though brandy is extracted from wine experience tells us, that there is a great difference in grapes, from which the wine is made. Every soil, every climate, every kind of grapes varies with regard to the quantity and quality of spirits extracted from them. There are some grapes which are only fit for eating, others for drying, as those of *Damascus*, *Corinth*, *Province* and *Avignon*; but not fit to make wine.

Some wines are very proper for distillation, others much less so. The wines of *Languedoc* and *Provence* afford a great deal of brandy by distillation, when the operation is made in their full strength: the *Orleans* wines, and those of *Blois* afford yet more; but the best are those of the territories of *Cogniac* and of *Andaye*, which are however

in the number of those the least drank in *France*. Whereas those of *Burgundy* and of *Champaign*, though of a very fine flavor, are improper, because they yield but very little in distillation.

It must also be farther observed, that all the wines for distillation, as those of *Spain*, the *Canaries*, of *Alicant*, of *Cyprus*, of *St. Peres*, of *Toquet*, of *Grave*, of *Hungary*, and others of the same kind, yield very little brandy by distillation; and consequently would cost the distiller considerable more than he could sell it for. What is drawn from them is indeed very good, always retaining the saccharine quality and rich flavor of the wine from whence it is drawn; but as it grows old, this flavor often grows aromatic, and is not agreeable to all palates.

Hence we see, that brandies always differ, according as they are extracted from different species of grapes. Nor would there be so great a similarity as there is between the different kinds of *French* brandies, were the strongest wines used for this purpose: But this is rarely the case, the weakest and lowest flavored wines only are distilled for their spirit, or such as prove absolutely unfit for any other use.

A large quantity of brandies is distilled in *France*, during the time of the vintage; for all those poor grapes that prove unfit for wine, are usually first gathered, pressed, their juice fermented, and directly distilled. This rids their hands of their poor wines at once, and leaves their casks empty for the reception of better. It is a general rule with them not to distil any wine that will fetch any price as wine; for, in this state, the profits upon them are vastly greater than when reduced to brandies. This large stock of small wines, with which they are almost overrun in *France*, sufficiently accounts for their making such vast quantities of brandy in *France*, more than other countries, which lie in warmer climates, and are much better adapted to the production of grapes.

Nor is this the only fund of their brandies; for all the wine that turns eager is also condemned to the still; and, in short, all that they can neither export nor consume at home, which amounts to a large quantity; since much of the wine laid in for their family provision is so poor as not to keep during the time in spending.

Hence many of our *American* spirits, with proper management are convertable into brandies, that shall hardly be distinguished from the foreign in many respects, provided this operation be neatly performed. And, in particular, how far a cyder spirit and a crab spirit may, even from the first extraction, be made to resemble the fine and thin brandies of *France*, we would recommend to those distillers whose skill and curiosity prompts them to under-

takings condemned by those who only work mechanically, and scorn to deviate from the beaten track, though they have the fairest prospect of acquiring profit to themselves and a lasting emolument to their country.

Article XI.

Of the Distillation of Rum.

Rum differs from what we simply call sugar spirit, as it contains more of the natural flavor, or essential oil, of the sugar cane; a great deal of raw juice, and even parts of the cane itself being often fermented in the liquor, or solution, of which the rum is prepared.

Hence we see from whence rum derives its flavor; namely, from the cane itself. Some indeed, are of opinion, that the unctuous or oily flavor of the rum proceeds from the large quantity of fat used in boiling the sugar. This fat, indeed, if coarse, will give a stinking flavor to the spirit in our distillations of the sugar liquor, or wash, from our refining sugar-houses; but this is nothing like the flavor of the rum; which, as we have already observed, is the effect of the natural flavor of the cane.

Great quantities of rum are made at *Jamaica*, *Barbadoes*, *Antigua* and other sugar islands. The method of making it is this:

When a sufficient stock of the materials is got together, they add water to them, and ferment them in the common method though the fermentation is always carried on very slowly at first; because at the beginning of the season for making rum in the islands, they want yeast, or some other ferment to make it work; but after this, they, by degrees, procure a sufficient quantity of the ferment, which rises up as a head to the liquor in the operation; and thus they are able afterwards to ferment and make their rum with a great deal of expedition, and in very large quantities.

When the wash is fully fermented, or to a due degree of acidity, the distillation is carried on in the common way, and the spirit is made up proof; though sometimes it is reduced to a much greater degree of strength, nearly approaching to that alcohol, or spirit of wine; and it is then called double-distilled rum.

It would be easy to rectify the spirit, and bring it to a much greater degree of purity than we usually find it to be of; for it brings over in the distillation a large quantity of the oil; and this is often so disagreeable, that the rum must be suffered to lie by a long time to mellow before it can be used; whereas, if well rectified, its flavor would be much less, and consequently much more agreeable to the palate.

The best state to keep rum both for exportation and other uses, is doubtless that of alcohol, or rectified spirits. In this manner, it would be contained in half the bulk it usually is, and might be let down to the common proof strength with water when necessary; for the common use of making punch, it would likewise serve much better in the state of alcohol; as the taste would be cleaner, and the strength might always be regulated to a much greater degree of exactness than in the ordinary way.

If the business of rectifying rum was more nicely managed, it seems a very practicable scheme to throw out so much of the oil as to reduce it to the fine light state of a clear spirit, but lightly impregnated with the oil; in this state it would nearly resemble arrac, as is easily proved by mixing a very small quantity of it with a tasteless spirit; for it then bears a very near resemblance to arrac in flavor.

Article XII.

Of Sugar-Spirit.

We mean by a sugar-spirit, that extracted from the washings, scummings, dross, and waste of a sugar-bakers refining-house.

These recrementitious, or drossy parts of the sugar, are to be diluted with water, fermented in the same manner as molasses or wash, and then distilled in the common method. And if the operation be carefully performed, and the spirit well rectified, it may be mixed with foreign brandies, and even arrac in a large proportion, to great advantage; for this spirit will be found superior to that extracted from treacle, and consequently more proper for these uses.

Article XIII.

Of Raisin-Spirits.

By raisin-spirits, we understand that extracted from raisins, after a proper fermentation.

In order to extract this spirit, the raisins must be infused in a proper quantity of water and fermented in the manner described in the article on fermentation. When the fermentation is completed, the whole is to be thrown into the still, and the spirit extracted by a strong fire.

The reason why we here direct a strong fire, is, because by that means a greater quantity of the essential oil will come over the helm with the spirit, which will render it much fitter for the distillers's purpose; for this spirit is generally used to mix with common malt goods: and it is surprising how far it will go in this respect, ten gallons of

it being often sufficient to give a determining flavor, and agreeable vinossity to a whole piece of malt spirits.

It is therefore well worth the distiller's while to endeavour at improving the common method of extracting spirts from raisins; and perhaps the following hint may merit attention:

When the fermentation is completed, and the still charged with fermented liquor, as before directed, let the whole be drawn off with as brisk a fire as possible; but instead of the cask or can, generally used by our American distillers for a receiver, let a large glass, called by chemists, a separating-glass, be placed under the nose of the worm, and a common receiver applied to the spout of the separating glass; by this means the essential oil will swim upon the top of the spirit, or rather low wine, in the separating glass, and may be easily preserved at the end of the operation.

The use of this limpid essential oil is well known to distillers; for in this resides the whole flavor, and consequently may be used to the greatest advantage in giving that distinguishing taste, and true vinosity, to the common malt spirits.

After the oil is separated from the low wine, the liquor may be rectified in *Balneum Mariæ*, into a pure and almost tasteless spirit; and therefore well adapted to make the finest compound cordials, or to imitate, or mix with the finest *French* brandies, arracs, &c.

In the same manner a spirit may be obtained from cyder. But as its particular flavor is not so desirable as that obtained from raisins, it should be distilled in a more gentle manner, and carefully rectified in the manner we shall shew in the article on rectification; by which means a very pure and almost insipid spirit will be obtained, which may be used to very great advantage in imitating the best brandies of *France*, or in making the finest compound waters or cordials.

Article XIV.

Of Arracs.

What is properly meant by the term arracs, are spirits extracted from the fermented juice of certain trees common in the *East-Indies*, particularly those of the cocoa, palm-tree. The whole process of making arrac, is performed in the following manner:

In order to procure the vegetable juice for this operation, the person provides himself with a sufficient number of small earthen pots, with bellies and necks, resembling our common glass bottles; a number of these he

fastens to his girdle, or to a belt across his shoulders, and climbs up the tall trunk of the cocoa-tree; having reached the boughs of the tree, he cuts off with a knife certain small, buds, or buttons, applying immediately to the wound one of his bottles, and fastens it with a string to the bough. In this manner he proceeds, till he has fixed his whole number of bottles, which serve as receivers to the juice distilling from the wounds. This operation is generally performed in the evening, a greater quantity of juice flowing from the tree in the night than in the day. The bottles are next morning taken off, and the liquor emptied into a proper vessel, where it spontaneously ferments. As soon as the fermentation is completed, the liquor is thrown into the still, and drawn down to a low wine; but so very poor and dilute, that they are obliged to rectify it in another still, to that weak kind of proof spirit, we generally see it; for though it appears bubble-proof, it rarely contains more than a sixth, and sometimes only an eighth of alcohol. All the rest being no more than an acidulated water, which might be supplied from any common spring. Why arrac appears bubble-proof, when in reality so far below what we mean by proof, is not so great a mystery as at first sight it appears to be; for this kind of proof is entirely owing to a certain tenacity of the parts of the liquor, or to the particular property of the oil incorporated in the spirit; as we shall abundantly shew in a subsequent article.

From this account of arrac, it should seem no very difficult matter to imitate it here. And, perhaps, the whole difficulty lies in procuring a pure and insipid spirit; for it is ridiculous to attempt it with our common malt spirit. With regard to the flavor of the arrac, it may be effectually imitated by some essential oils easily procurable.

Hence we see of what prodigious advantage a pure and insipid spirit would be of to distillers, and consequently the great encouragement there is to attempt the discovery. Perhaps a spirit of this kind may be extracted from sugar properly refined. The hint is worth prosecuting, and the writer of this essay, from repeated experiments, is abundantly convinced that the thing is practicable. Had he entirely succeeded, he would readily have communicated the whole for the benefit of his country; but is now obliged to defer, to some future opportunity, the result of his enquiries. In the mean time, he would recommend the prosecution of this hint to those distillers who endeavour to improve their art, and to advance it nearer to perfection.

Since arrac is a spirit extracted from the juice of the cocoa-tree, it may perhaps be worth enquiring how nearly it may be imitated by fermenting and distilling the juices

of the birch and sycamore-trees. We should by this means obtain an American arrac; and, perhaps, a spirit equal in flavor to that imported from *Batavia.*

When the cask, in which the arrac is imported, happens to be decayed, or the liquor touches any nails, or other iron, it dissolves part of it, and at the same time extracts the resinous parts of the oak, by which means the whole liquor in the cask acquires an inky colour. In order to whiten and clarify arrac, which has contracted this colour, a large quantity of new or skimmed milk must be put into the cask, and the whole beat together, as vinters do to whiten their brown wines; by this means the inky colour will be absorbed by the milk, and fall with it to the bottom, so that the greatest part of the arrac may be drawn off fine, and the remainder procured in the same condition by being filtrated through a conical flannel bag.

Article XV.

Of Rectification.

There are several methods of performing this operation; though some, and indeed those in general practised by our distillers, hardly deserve the name; because, instead of rectifying, that is, freeing the spirit from its essential oil and phlegm, they alter the natural flavor of the spirit that comes over in the operation.

The principle business of rectification is to separate the spirit from the essential oil of the ingredient, which is very apt to adhere strongly to the spirit. And in order to this, care should be taken in the first distillation; that is the spirit, especially that from malt, should be drawn by a gentle fire, by which means great part of the essential oil will be kept from mixing with the spirit; for experience has abundantly proved, that it is much easier to keep asunder, than to separate them when once mixed.

But as it is almost impossible to draw low wines without the spirit being in some measure impregnated with the essential oil, it is absolutely necessary to be acquainted with some methods of separating the spirit from the oil, and also of freeing it from its phlegm. The best methods of doing this to perfection, are re-distillation and percolation.

In order to rectify low wines, they should be put into a tall body, or alembic, and gently distilled in *Balneum Mariæ;* by this means a large proportion, both of the oil and phlegm will remain in the body. But if the spirit should be found, after this operation, to contain some of the essential oil, it must be let down with fair water, and re-distilled, in the same gentle manner. And thus it may

be brought to any degree of purity ; especially if in the working, the spirit be suffered to fall into a proper quantity of *Balneum Mariæ*. But it must be remembered, that it is much more difficult to cleanse alcohol, or proof-spirit than low wines, because the oil is more intimately mixed with the two former than with the latter. This oil may however be separated from proof-spirit, &c by the method already proposed, especially if it be previously filtrated through paper, thick flannel, sand, stone, &c.

But this method, though it effectually answers the intention, is generally rejected by our distillers, because of the slowness of the operation ; and others substituted in its stead, though instead of freeing the spirit from the oil, they only abolish the natural flavor of the spirit, and make a more intimate mixture between the particles of the spirit, and those of the essential oil.

It is impossible to enumerate all the methods practised by distillers, as almost every one pretends to have a secret nostrum for this purpose. The principal methods in use for rectifying malt spirits, are however reducible to three, namely, by fixed alkaline salts, by acid spirits mixed with alkaline salts, and by saline bodies, and flavoring additions.

The method of rectifying by alkaline salts is thus performed : To every piece of proof-spirit, add fourteen pounds of dry salt of tartar, fixed nitre, or calcined tartar ; lute on the head, and distil by a gentle heat, but be very careful to leave out the faints. By this method a large proportion of the fœtid oil will be left in the still ; and what comes over with the spirit will be greatly attenuated.— But this operation is generally performed in a very different manner ; for instead of distilling the spirit in a gentle and equable manner, the still is worked in its full force ; by which means the oil, which should have remained in the still, is driven over, and intimately mixed with the spirit ; and consequently, the whole operation frustrated, and the spirit rendered much harder to cleanse than it was before.

But even when the operation is performed according to the rules of art, it is far from being perfect ; for it is well known, that part of the fixed salts become volatile in the operation, pass over the helm, and intimately mixes with the essential oil still contained in the spirits ; by this means the oil becomes more perfectly united with the spirits, and consequently much harder to be separated by repeated distillations. Nor is this all for the still being worked in its full force, the bitter oil of the malt, formed into a kind of liquid soap in the still, by means of the alkaline salt, is brought over the helm with the faints, and suffered to mix.

with the spirit, whereby it is rendered almost as nauseous and ill-tasted as before the operation. Besides, if this operation were performed in its utmost perfection, it would never answer the intention; for the alkaline salt destroys the vinosity of the spirit, and consequently deprives it of one of its most valuable properties. Our distillers are well acquainted with this defect in the operation, and endeavour to supply it by an addition of acids. This is what we call the second method by alkalies and acids.

The operation of rectifying by the method of fixed alkalies and acids, is the same as that above described; the spirit is drawn over from fixed alkalies as before; but in order to mortify the alkali in the spirit, and restore its vinosity, a proper quantity of some acid spirit is added — Various kinds of acids are used on this occasion; but principally those of the mineral kind, because of their cheapness; as oil of vitriol, spirit of nitre, oil of sulphur, and the like. We would, however, caution a young distiller from being too busy with these corrosive acids; the sulphureous spirit of vitriol, dulcified spirit of nitre, or Mr. Boyle's acid spirit of wine well rectified, will much better answer his purpose.

The third method of rectification is that by saline bodies and flavoring ingredients. There is no difference in the operation between this and the two foregoing methods; fixed alkaline salts, common salt depreciated or dried, calcined vitriol, sandiver, alum, &c. is put into the still with the low wines and the spirit drawn over as before.— When the quantity is drawn off, the flavoring ingredients are added to give the spirit the flavor intend. But as the spirit is not by this means rendered sufficiently pure, the disagreeable flavor of the spirit generally overpowers that of the ingredients, whereby the whole intention is either destroyed, or a compound flavour produced, very different from that intended.

Some distillers, instead of alkaline salts, use quick lime in rectifying their malt spirit; this engredient cleanses and dephlegmates the spirit considerably; but like that rectified from alkaline salts, it requires an alkaline disposition, and also a nidorous flavor. Acids, therefore, are as necessary to be mixed with those spirits rectified with quick lime, as with those rectified with an alkaline salt. If chalk, calcined and well purified animal bones, &c. were used instead of quick lime, the spirit would have a much less alkaline or nidorous flavor; and, consequenly, the flavoring ingredients might be added to it with more success than can be expected from a spirit rectified from alkaline salts.

But, perhaps, if neutral salts were used instead of the alkaline ones, the spirit might be rendered pure, without

contracting an alkaline flavor; soluble tartar might be used for this purpose, though the spirit acquires from hence a little saponaceous flavor. Dr. Cox has mentioned another method for this purpose, namely, to deprive the volatile salts of their oil, by rendering them neutral with spirit of salt, and afterwards subliming them with salt of tartar: the acid may be varied, if the spirit of salt should not be found so well adapted to the purpose as could be wished: but fine dry sugar seems the best adapted to the purpose of rectifying these spirits; as it readily unites with the essential oil, detains and fixes it, without imparting any urinous, alkaline, or other nauseous flavor to the spirits rectified upon it.

Thus have I considered the principal methods used by our distillers in rectifying their spirits; and shall conclude this article with remarking, that there is no other way of rectifying to perfection, besides what we first laid down, namely, by gentle distillation. But then it must be remembered, that the whole process must be of a piece; we mean, that the first distillation from the wash must be performed in a gentle manner; for otherwise the essentil oil will be so intimately blended with the spirit, as not to be easily separated by re-distillation. Another good property attending this method is its universality; all kinds of spirits, from whatever ingredients extracted, require rectification; and this is adapted to all kinds.

Article XVI.

Of the Flavoring of Spirits.

We have observed in the preceding article, that the common method of rectifying spirits from alkaline salts, destroys their vinosity, and in its stead introduces an urinous or lixivious taste. But as it is absolutely necessary to restore, or at least to substitute in its room, some degree of vinosity, several methods have been proposed, and a multitude of experiments performed, in order to discover this great *desideratum:* but none has succeeded equal to the spirit of nitre; and accordingly this spirit, either strong or dulcified, has been used by most distillers, to give an agreeable vinosity to their spirits.

Several difficulties, however, occur in the method of using it, the principal of which is, its being apt to quit the liquor in a short time, and consequently depriving the liquor of that vinosity it was intended to give. In order to remove this difficulty, and prevent the vinosity from quitting the goods, the dulcified spirit of nitre, which is much better than the strong spirit, should be prepared by a previous digestion continued for some time with alcohol; the longer the digestion is continued the more intimately

will they be blended, and the compound rendered the milder and softer.

After a proper digestion, the dulcified spirit should be mixed with the brandy, by which means the vinosity will be intimately blended with the goods, and disposed not to fly off for a very considerable time.

No general rule can be given for the quantity of this mineral acid requisite to be employed, because different proportions of it are necessary in different spirits. It should, however, be carefully adverted to that though a small quantity of it will undoubtedly give an a greeable vinosity resembling that naturally found in the fine subtile spirits drawn from wines yet an over large dose of it will not only cause a disagreeable flavor, but also render the whole design abortive, by discovering the imposition. Those therefore, who endeavour to cover a foul taste in goods by large doses of dulcified spirit of nitre, will find themselves deceived.

But the best, and indeed the only method of imitating *French* brandies to perfection, is by an essential oil of wine; this being the very thing that gives the *French* brandies their flavour. It must, however, be remembered, that in order to use even this ingredient to advantage, a pure, tasteless spirit must be first procured; for it is ridiculous to expect that this essential oil should be able to give the agreeable flavor of *French* brandies, to our fulsome malt spirit, already loaded with its own nauseous oil, or strongly impregnated with a lixivious taste from the alkaline salts used in rectification. How a pure insipid spirit may be obtained has been already considered in some of the preceding articles; it only therefore remains to shew the method of procuring this essential oil of wine, which is this.

Take some cakes of dry wine-lees, such as are used by our hatters, dissolve them in six or eight times their weight of water distil the liquor with a slow fire, and separate the oil by the separating glass; reserving for the nicest uses that only which comes over first, the succeeding oil being coarser and more resinous.

Having procured this fine oil of wine, it may be mixed into a quintessence with pure alcohol; by which means it may be preserved a long time fully possessed of all its flavour and virtues; but without such management, it will soon grow resinous and rancid.

When a fine essential oil of wine is thus procured, and also a pure and insipid spirit, *French* brandies may be imitated to perfection with regard to the flavor. It must, however, be remembered, and carefully adverted to, that the essential oil be drawn from the same sort of lees as the brandy to be imitated was procured from; we mean,

in order to imitate *Cogniac* brandy, it will be necessary to distil the essential oil from *Cogniac* lees; and the same for any other kind of brandy. For as different brandies have different flavors; and as these flavors are owing entirely to the essential oil of the grape, it would be preposterous to endeavour to imitate the flavor of *Cogniac* brandy, with an essential oil procured from the less of *Bordeaux* wine.

When the flavour of the brandy is well imitated by a proper dose of the essential oil, and the whole reduced into one simple and homogeneous fluid, other difficulties are still behind: the flavor, though the essential part, is not however the only one; the colour, the proof and the softness must be also regarded, before a spirit, that perfectly resembles brandy, can be procured. With regard to the proof, it may be easily hit, by using a spirit rectified above proof; which, after being intimately mixed with the essential oil of wine, may be let down to a proper standard by fair water. And the softness may in a great measure be obtained by distilling and rectifying the spirit with a gentle fire; and what is wanting of this criterion in the liquor, when first made, will be supplied by time; for it must be remembered, that it is time alone that gives this property to *French* brandies; they being at first like our spirits, acrid, foul and fiery. But with regard to the colour, a particular method is necessary to intimate it to perfection: and how this may be done, shall be considered in the next article.

Article XVII.

Of the Methods of Colouring Spirits.

The art of colouring spirits owes its rise to observations on foreign brandies. A piece of *French* brandy that has acquired by age a great degree of softness and ripeness, is observed at the same time, to have acquired a yellowish brown colour; and hence our distillers have endeavoured to imitate this colour in such spirits as are intended to pass for *French* brandy. And in order to this a great variety of experiments has been made on various substances, in order to discover a direct and sure method of imitating this colour to perfection. But, in order to do this, it is necessary to know from whence the *French* brandies themselves acquires their colour; for till we have made this discovery, it will be in vain to attempt an imitation; because if we should be able to imitate exactly the colour, which is indeed no difficult task, the spirit will not stand the test of different experiments, unless the colour in both be produced from the same ingredient.

This being undeniably the case, let us try if we cannot

discover this mighty secret; the ingredient from whence the *French* brandy acquires its colour.

We have already observed, that this colour is only found in such brandies as have acquired a mellow ripeness by age; it is therefore not given it by the distiller, but has gained it by laying long in the cask. Consequently, the ingredient from whence this colour is extracted, is no other than the wood of the cask, and the brandy in reality is become a dilute tincture of oak.

The common experiment used to prove the genuineness of *French* brandy proves, that this opinion is well founded. The experiment is this: they pour into a glass of brandy a few drops of a solution of calcined vitriol of iron in a diluted spirit of sulphur, or any other mineral acid, and the whole turns of a blue colour; in the same manner as we make ink of a tincture of galls and vitriol.

Since, therefore, the colour of *French* brandies is acquired from the oak of the cask, it is no difficulty to imitate it to perfection. A small quantity of the extract of oak, or the shaving of that wood properly digested, will furnish us with a tincture capable of giving the spirit any degree of colour required. But it must be remembered, that as the tincture is extracted from the cask by brandy, that is alcohol and water, it is necessary to use both in extracting the tinctur; for each of these menstruums dissolves different parts of the wood. Let, therefore, a sufficient quantity of oak shavings be digested in strong spirit of wine; and also at the same time other oak shavings be digested in water: and when the liquors have acquired a strong tincture from the oak, let both be poured off from the shavings into different vessels, and both placed over a gentle fire till reduced to the consistence of treacle. In this condition, let the two extracts be intimately mixed together; which may be done effectually by adding a small quantity of loaf sugar, in fine powder, and well rubbing the whole together. By this means a liquid essential extract of oak will be procured, and always ready to be used as occasion shall require.

There are other methods in use for colouring brandies; but the best, besides the extract of oak above-mentioned, are common treacle and burnt sugar.

The treacle gives the spirits a fine colour, nearly resembling that of *French* brandy; but as its colour is but dilute, a large quantity must be used; this is not however attended with any bad consequences; for notwithstanding the spirit is really weakened by this addition, yet the bubble proof, the general criterion of spirits, is greatly mended by the tenacity imparted to the liquor by the treacle. The spirit also acquires from this mixture a sweetish or

luscious taste, and a fullness in the mouth; both which properties render it very agreeable to the palates of the common people, who are, in fact, the principal consumers of these spirits

A much smaller quantity of burnt sugar than of treacle will be sufficient for colouring the same quantity of spirits; the taste is also very different; for instead of the sweetness imparted by the treacle, the spirit acquires from the the burnt sugar an agreeable bitterness, and by that means recommends itself to nicer palates, which are offended with a luscious spirit. The burnt sugar is prepared by dissolving a proper quantity of sugar in a little water, and scorching it over the fire till it acquires a black colour.

Either of the above ingredients, treacle or burnt sugar, will nearly imitate the genuine colour of old *French* brandy; but neither of them will succeed, when put to the test of the vitriolic solution.

Thus have I traced the subject of distillation from its origin shewn the methods commonly made use of by distillers, and pointed out various improvements, that might be introduced into this art with great advantage; and shall conclude this chapter with recommending the several hints to those distillers who are desirous of improving their art, and proceeding on a rational foundation, it being from such only that improvements are to be expected; for where the operations are constantly carried on in the same beaten track, it is in vain to expect; improvements, unless chance should be kind enough to throw that in their way, which a rational theory would have easily led them to discover.

CHAP. II.

THE METHOD OF DISTILLING SIMPLE WATERS.

Article I.

Of Rose-Water.

The damask rose is the species intended to be used in this operation; it is of a very fragrant smell, and flowers in June and July. The water may be made either by the hot still, the cold still, or the *Balneum Mariæ*. If the hot still be used, the leaves picked from the stalks must be put into the still with a sufficient quantity of water to prevent an empyreuma, and the water drawn off by a gentle fire. The receiver must be luted with a bladder to the

nose of the worm, to prevent the finest and most volatile parts from evaporating, which they would otherwise do, to the great prejudice of the water

If the cold still be used, the rose leaves, either with the dew on them, or sprinkled with water, must be laid on the iron plate and covered with the conical head. A gentle fire must then be made under the plate, and a receiver luted with a bladder to the nose of the still. The water will gradually distil into the receiver, and be strongly impregnated with the odoriferous parts of the roses.

The same method with regard to the *Balneum Mariæ* must be used in the distillation of roses as in that of orange-flowers, and therefore need not be repeated here. We shall therefore only observe, that rose-water, drawn either by the cold still, or the *Balneum Mariæ*, is much preferable to that drawn by the hot still.

The essence, or essential oil of roses is looked upon as one of the most valuable perfumes in the world; but at the same time the most difficult to be procured in any quantity. A small quantity of it is made in Italy, but it has always been thought impossible to procure it here; and, therefore, a method of acquiring this valuable commodity will not, I presume, be disagreeable to the reader.

Take a quantity of damask rose leaves, put them into a proper vessel, with a sufficient quantity of water, adding some mineral acid, as spirit of salt, vitriol, &c. In this menstruum let the roses be digested for fifteen days; after which put the whole into an alembic, and draw off the water with a pretty brisk fire. But, instead of the common receiver, a separating-glass must be placed under the nose of the worm, and a receiver added to the tube of the separating glass. By this means all the oil or essence will float on the surface of the water in the separating-glass, and may easily be separated from it when the operation is finished.

Article II.

Of Cinnamon-Water.

Cinnamon is a thin fine bark, rolled up in a sort of little pipes, from the thickness of a goose-quill, to that of a man's thumb, and sometimes more, and about two or three feet long. Its colour brownish, with a mixture of red. It is of an extremely aromatic smell, and of an acrid and pungent, but very agreeable taste. It is the interior or second bark of a tree that grows plentifully in *Ceylon*. The people who gather it take off the two barks together, and immediately separating the outer one, which is rough, and has very little fragrancy, they lay the other to dry in the shade in an airy place, where it rolls itself up into the form wherein we see it.

The greatest cheats in the sale of cinnamon, are the selling such as has already had its essential oil distilled from it, and dried again, and the imposing cassia lignea in its place. The first of these is discovered by the want of pungency in the cinnamon; the second by this, that the cassia, when held a little time in the mouth, becomes mucilaginous, which the true cinnamon never does. Cinnamon is a noble drug, endued with many capital virtues; it strengthens the viscera, assists concoction, dispels flatulencies, and is a pleasant cardiac.

Receipe for one gallon of simple Cinnamon-Water.

Take a pound of the best cinnamon grossly powdered, digest for twenty-four hours, in two gallons of water; put the whole into an alembic, and draw over one gallon with a pretty brisk fire.

The oil of cinnamon, in which the specific virtue of the drug consists, is very ponderous, and therefore will not come over the helm unless the fire be pretty brisk, especially with a simple water. It will therefore be in vain to attempt distilling simple cinnamon-water by the *Balneum Mariæ*.

Article III.

Of Fennel-Water.

Fennel-water is extracted from a seed larger and more beautiful than that produced by our common fennel; it is called *Sweet Fennel seed*, being of a fragrant smell, and aromatic sweet taste, and is cultivated in *France* and *Italy* It is to be chosen, new, large, and fair; but when damp or dusty to be rejected.

Receipe for one Gallon of Fennel-Water.

Take one pound of sweet fennel-seeds, and two gallons of water; put them into an alembic, and draw off one gallon with a gentle fire.

Article IV.

Of Peppermint-Water.

Pepper-mint is a very celebrated stomachic, and on that account greatly used at present, and its simple water often called for.

Receipe for a gallon of Peppermint-Water.

Take of the leaves of dried peppermint, one pound and a half; water, two gallons and a half; put all into an alembic, and draw off one gallon, with a gentle fire.

The water obtained from peppermint by distillation in *Balneum Mariæ*, is more fragrant and more fully impregnated with the virtues of the plant than that drawn by the alembic. The same may be said with regard to that extracted by the cold still; when the cold still is used the plant must be green and if possible committed to the still with the morning dew upon it.

Article V.

Of Spearmint-Water.

Spearmint is also like peppermint, a great stomachic, and therefore constantly used.

Recipe for one gallon of Spearmint-Water.

Take of the leaves of dried spearmint one pound and a half; water two gallons and a half; draw off by a gentle fire one gallon.

This water, like that drawn from pepperment, will be more fragrant if distilled in *Balneum Mariæ*, or the cold still; but if the latter be used, the same caution must be observed of distilling the plant green.

Article VI.

Of Balm-Water.

Balm is a plant well known in our gardens. It flowers in July, and is of a fine cordial flavor; but so weak, that it is soon dissipated and lost; nor is it easy to dry it so as to preserve its natural scent

Balm-water, therefore, should be drawn when the plant is green; and in order to procure the water in full perfection, it should be cohobated, or returned several times upon fresh parcels of the plant; by this means a water may be procured from balm extremely rich, and of considerable use as a cordial.

If the *Balneum Mariæ* be used, the water is much better than that drawn by an alembic. The water drawn from this plant by the cold still will also be very fragrant, and highly impregnated with the virtues of the plant.

Article VII.

Of Pennyroyal-Water.

Pennyroyal, a plant very common in America, is very warm, and its parts very subtile and penetrating: it is one of the first plants in esteem in the present practice, as well as in former ages, as attenuant and uterine. It is good

in flatulencies and suppressions of urine, and by many is greatly recommended in dropsies, jaundices, and other chronic distempers. It communicates its virtues to water in infusion, and its simple water has, perhaps, more virtue than any other kept in the shops. But as it is requisite in order to obtain a water fully impregnated with the virtues of balm, to cohobate it on fresh parcels of the plant; the water drawn from green pennyroyal, on the contrary, generally contains so large a portion of the essential oil, that it is necessary to separate what floats on the surface of the water, by the seperating-glass.

Recipe for one gallon of Pennyroyal-Water.

Take of the dried leaves of pennyroyal one pound and a half of water three gallons; draw off one gallon with a gentle fire.

The water drawn from green pennyroyal by the cold still, is very fragrant, and fully impregnated with the virtues of the plant.

CHAP. III.

OF MAKING COMPOUND WATERS AND CORDIALS.

ARTICLE I.

Of strong Cinnamon-Water.

WE have already [Chap. II. Art. II.] described this drug, and given some directions for chusing the best sort, to which the reader is referred.

Recipe for sixteen gallons of strong Cinnamon-Water.

Take eight pounds of fine cinnamon bruised, seventeen gallons of clean rectified spirit, and two gallons of water. Put them into your still, and digest them twenty-four hours with a gentle heat; after which draw off sixteen gallons by a pretty strong heat.

I have ordered a much larger quantity of cinnamon than is common among distillers; because, when made in the manner above directed, it is justly looked upon as one of the noblest cordial waters of the shops; but when made in the common way, of two pounds to twenty gallons of spirit, as some have ordered, is only an imposition on the buyer. Some also, to render the goods cheaper, use equal quantities of cinnamon and cassia and lignea; but by this

means the cordial is rendered much worse; and, therefore, if you desire a fine cinnamon water, the above recipe will answer you intention; but if a cheaper sort be desired, you may lessen the quantity of cinnamon and add cassia lignea in its stead. If you would dulcify your cinnamon-water, take double-refined sugar, what quantity you please; the general proportion is about two pounds to a gallon, and dissolve it in the spirit after you have made it up proof with clean water. One general caution is here necessary to be added, namely, that near the end of the operation you carefully watch the spirit as it runs into the receiver, in order to prevent the faints mixing with the goods. This you may discover by often catching some of it, as it runs from the worm, in a glass, and observing whether it is fine and transparent; for as soon as ever the faints begin to rise, the spirit will have an azure, or bluish cast. As soon, therefore, as you perceive this alteration, change the receiver immediately; for if you suffer the faints to mix with your other goods, the value of the whole will be greatly lessened. With regard to the faints, they are to be kept by themselves, and poured into the still when a fresh parcel of the same goods is to be made.

It is also necessary to observe here, once for all, that the distillers call all goods made up proof, *double goods*; and those which are below proof, *single*. This observation will be alone sufficient to instruct the young distiller how he may at any time turn his proof or double goods into single.

Article II.

Of Clove-Water.

Cloves, from whence this water takes its name, are the fruit of a tree growing in the *Molucca* islands. The figure of this fruit is oblong, and not very thick, resembling, in some measure, a nail. The surface of it is rough, and the colour a dusky brown, with an admixture of redish The whole fruit is of an extremely fragrant smell, and of an acid, pungent, and very aromatic taste Cloves are to be chosen the largest, fairest, darkest coloured, the heaviest, and most unctuous on the surface, when pressed between the fingers. Cloves are carminative, and good against all distempers of the head arising from cold causes They strengthen the sight, and are good against faintings, palpitations of the heart, and crudities in the stomach.

Recipe for fifteen gallons of Clove-Water.

Take of cloves bruised four pounds, pimento or allspice, clean proof of spirit sixteen gallons; let it digest twelve

hours in a gentle heat, and then draw off fifteen gallons with a pretty brisk fire. Or,

Take *Winter's* bark four pounds, pimento six ounces, clover one pound and a quarter, clean proof of spirits sixteen gallons: digest, and draw off as before.

The *Winter's* bark, added in the second recipe, is the bark of a large tree, growing in several parts of *America*, and has its name from its discoverer, Captain *Winter*.

The outer rind of it is of an uneven surface, and of a loose texture, very brittle, and easily powdered. The inner part, in which principal virtue resides, is hard, and of a dusky redish brown colour. It is of an extremely fragrant and aromotic smell, and of a sharp, pungent, and spicy taste, much hotter than cinnamon in the mouth, and leaving in it a more lasting flavor. It is to be chosen in pieces not too large, having the inner or brown part firm and sound, and of a very pungent taste It is apt to be worm-eaten; but in that case it should be wholly rejected as having lost the most essential part of its virtue.

If you desire to have your clove-water red, it may be coloured either by a strong tincture of cochineal, alkanet-root, or corn-poppy flowers. The first gives the most elegent colour, but it is not often used on account of its dearness.

You may dulcify it to your palate, by dissolving in it double-refined sugar. Some for cheapness use a coarser kind of sugar: but this renders the goods foul and unsightly. Some also, to save expences, make what they call clove-water, with cloves and caraway seeds; the proportion they generally use is half an ounce of cloves and two drachms of carraway-seeds to a gallon of spirit.

Article III.

Of Citron-Water.

The citron is an agreeable fruit resembling a lemon in colour, smell, and taste. The inside is white, fleshy and thick, containing but a small quantity of pulp, in proportion to the bigness of the fruit.

Recipe for making ten gallons of Citron-Water.

Take of dry yellow rinds of citron four pounds, clean proof spirit ten gallons and a half, water one gallon; digest the whole twenty-four hours with a gentle heat; draw off ten gallons with a gentle fire; or, which is much better, in *Balneum Mariæ*, and dulcify it with fine sugar to your palate. Or,

Take of dry yellow rinds of citrons three pounds, of

orange peel two pounds, nutmegs bruised three quarters of a pound; digest, draw off, and dulcify as before.

This is one of the most pleasant cordials we have; and the addition of the nutmegs, in the second receipt, increases its virtue as a cephalic and stomachic.

Article IV.

Of Aniseed-Water.

Aniseed is a small seed of an oblong shape, each way ending in an obtuse point; its surface is very deeply striated, and it is of a soft and lax substance, very light, and easily broken. Its colour is a kind of pale olive or greenish grey; it has a very strong and aromatic smell, and a sweetish but acrid taste, but in the whole not disagreeable. Aniseed should be chosen large, fair, new, and clean, of a good smell, and acrid taste. The plant that produces it is cultivated in many parts of *France*; but the finest seed comes from the island of *Malta*, where it is raised for sale, and whence a great part of *Europe* is supplied.

Recipe for ten gallons of Aniseed-Water.

Take of aniseed bruised two pounds, proof spirit twelve gallons and a half, water one gallon; draw off ten gallons with a moderate fire. Or,

Take of the seed of anise and angelica, each two pounds, proof spirit twelve gallons and a half; draw off as before.

Aniseed-water should never be reduced below proof, because of the large quantity of oil with which the spirit is impregnated, and which will render the goods milky and foul, when brought down below proof; but if there be a necessity for doing this, the goods must be filtrated either through paper or the filtrating bag, which will restore their transparency.

Aniseed water is a good carminative, and therefore in great request among the common people against the cholic.

Article V.

Of Mint-Water.

The mint intended in this receipe is the common spearmint, an account of which has already been given, [Chap II. Art. V.]

Recipe for ten gallons of Mint-Water.

Take of dry spearmint leaves fourteen pounds, proof spirit ten gallons and a half, water two gallons; draw off ten gallons by a gentle heat. You may dulcify it with sugar if required.

Mint-water is greatly recommended by the learned *Boerhaave* and *Hoffman* against vomiting, nauseas, and the cholic.

Article VI.

Of Peppermint-Water.

The peppermint has been already described, [Chap II. Art. IV.] to which the reader is referred.

Receipe for ten gallons of Peppermint-Water.

Take of dry peppermint leaves fourteen pounds, proof spirit ten gallons and a half, water one gallon draw off ten gallons by a gentle fire. You may either dulcify it or not.

Peppermint-water is a noble stomachic, good against vomiting, nauseas, cholic, and other griping pains in the bowels; in all which intentions it greatly exceeds the common spearmint-water.

Article VII.

Of Usquebaugh.

Usquebaugh, is a very celebrated cordial, the basis of which is saffron. There are different ways of making this famous compound; but the following are equal to any I have seen.

Receipe for ten gallons of common Usquebaugh.

Take of nutmegs, cloves, and cinnamon, of each two ounces; of the seeds of anise, caraway, and coriander, of each four ounces; liquorice-root sliced, half a pound; bruise the seeds and spices and put them together with the liquorice into the still with eleven gallons of proof spirits, and two gallons of water; distil with a pretty brisk fire till the faints begin to rise. But as soon as your still begins to work, fasten to the nose of the worm two ounces of English saffron tied up in a cloth, that the liquor may run through it, and extract all its tincture; and in order to this you should often press the saffron with your fingers. When the operation is finished, dulcify your goods with fine sugar.

Receipe for making ten gallons of Royal Usquebaugh.

Take of cinnamon, ginger, and coriander-seed, of each three ounces; nutmegs, four ounces and a half; mace, cloves, and cubebs, of each one ounce and a half. Bruise

these ingredients, and but them into an alembic with eleven gallons of proof spirit, and two gallons of water; and distil till the faints begin to rise; fastening four ounces and a half of English saffron tied in a cloth to the end of the worm, as directed in the preceding recipe. Take raisins, stoned, four pounds and a half; dates, three pounds; liquorice-roots sliced, two pounds; digest these twelve hours in two gallons of water; strain out the clear liquor add it to that obtained by distillation, and dulcify the whole with fine sugar.

Receipe for ten gallons of Usquebaugh by digestion.

Take of raisins stoned, five pounds; figs sliced, one pound and a half; cinnamon half a pound; nutmegs three ounces; cloves and mace, of each one ounce and a half; liquorice two pounds; saffron four ounces; bruise the spices, slice the liquorice, and pull the saffron in pieces; digest these ingredients eight days in ten gallons of proof spirit, in a vessel close stopped; then filter the liquor, and add to it two gallons of *Canary* wine, and half an ounce of the tincture of ambergris.

Receipe for making ten gallons of French Usquebaugh.

Take of saffron three ounces of the essential oil or essence of Florentine citron, bergamot, *Portugal* orange, and lemon, of each a hundred drops; angelica seed, vanellos, and mace, of each one ounce and a half; cloves and coriander-seed, of each three quarters of an ounce; bruise the seeds and spices, and put all into an alembic with eleven gallons of proof spirit, and two gallons of water; and draw off with a gentle fire till the faints begin to rise, fastening to the nose of the worm four ounces of saffron in a cloth. When the operation is finished dulcify the goods with fine sugar.

These waters are excellent cephalic cordials, and alexipharmics; and are excelled by nothing in suddenly reviving the spirits when depressed by sickness, &c.

Article VIII.

Of ratafia.

Ratafia is a liquor in great esteem, and most persons are acquainted with it; though the true method of making it is known only to a few. There are various kinds of ratafia made from different fruits. I shall give recipes for making those which are at present in most esteem; which may serve as instances for making these goods from any other kinds of fruit.

Of red Ratafia.

There are three sorts of ratafia drawn from red fruits, distinguished by the ephithets, *fine*, *dry*, and *common*.

The fruits most proper to make the red ratafia are the black heart cherry, the common red cherry, the black cherry, the merry or honey cherry, the strawberry, the raspberry, the red gooseberry, and the mulberry.

These fruits should be gathered in the height of their respective seasons, and the largest and most beautiful of them chosen for that purpose.

Thus with regard to the heart cherry, it should be large fleshy, and thorough but not over ripe; for then a part of its juice will be evaporated on the tree; care must be also taken that its colour be not decayed; but clear and almost transparent, and well tasted.

The black cherry, or as it is often called, the black arvon, must be extremely ripe, because it is used to colour the ratafia when that of the other fails. The criterion of judging when it is thoroughly ripe, is its blackness; for, when in perfection, it is perfectly black. It should also be remembered that this fruit is better and more profitable in proportion to its sweetness; as the flavor of the ratafia will be rendered more agreeable, and a less quantity of sugar necessary.

As the gooseberry is an acid fruit, it must be chosen as ripe as possible. The fruit large, and the skin and husk so transparent as to see the seeds through it. The gooseberry should be used immediately after its being gathered, for it is very liable to ferment, which will inevitably spoil the ratafia. Gooseberries are chiefly used to render the ratafia dry or sharp, and consequently less soft, and therefore their quantity should always be proportioned to that intention.

The merry cherry to be good should be small, black, the skin transparent, full of liquor, of a deep black purple colour. The greatest care should be taken, that it be fresh gathered, and not rotten. It corrects the acid juices of the other fruits by its sweetness, softens the composition, and is of great service in colouring the ratafia.

The mulberry is of the greatest service in colouring the ratafia. It should be chosen large, and fully ripe, at which time it is of a black purple colour. Its taste also greatly contributes to render the ratafia of a pleasant and agreeable flavor.

The strawberry greatly contributes to increase the rich flavor of the ratafia; but it must be chosen ripe and large, fresh gathered and not bruised. Another caution necessary to this fruit is, that they are gathered in dry

warm weather ; for if gathered in rainy weather, they will want that fine taste, for which they are so greatly valued.

The raspberry is also added to augment the richness of the liquor, to which its elegant perfumy taste greatly contributes ; by its agreeable acidity it renders the flavor more brisk and agreeable. It must be fresh gathered, full ripe, and free from spots and mouldiness, which the fruit is particularly subject to.

Having thus concisely enumerated the qualities requisite in the several fruits to render the ratafia of a rich elegant flavor, we shall proceed to give the best methods for making ratafia from them.

Recipe for making red Ratafia fine and soft.

Take of the black heart cherries, twenty-four pounds, black cherries, four pounds, raspberries and strawberries, of each three pounds, pick these fruits from their stalks and bruise them, in which condition let them continue twelve hours, press out the juice, and to every pint of it add a quarter of a pound of sugar. When the sugar is dissolved, run the whole through the filtrating bag, and add to it three quarts of clean proof spirits. Then take of cinnamon four ounces, of mace an ounce, and of cloves two drachms. Bruise these spices, put them into an alembic, with a gallon of clean proof spirits and two quarts of water, and draw off a gallon with a brisk fire. Add as much of this spicy spirit to your ratafia as will render it agreeable to your palate, about one fourth is the usual proportion.

Ratafia made according to the above recipe will be of a very rich flavour, and elegant colour. It may be rendered more or less of a spicy flavor, by adding or diminishing the quantity of spirit distilled from the spices.

Some in making ratafia, suffer the expressed juices of their fruits, to ferment several days ; by this means the vinosity of the ratafia is increased ; but, at the same time, the elegant flavor of the fruits greatly diminished. Wherefore, if the ratafia be desired stronger or more vinous, it may be done by adding more spirits to the expressed juice by which means the flavor of the fruits may be preserved, as well as the ratafia rendered stronger.

It is also a method with some to tie the spices in a linen rag, and suspend them in the ratafia. But if this method be taken, it will be necessary to augment the quantity of spirit first added to the expressed juice. There is no great difference in the two methods of adding the spices, except that by suspending them in the ratafia, the liquor is generally rendered less bright and transparent.

There is also another method practised in making ratafia, which is this: take the quantity of fruit proposed, bruise it, and immediately pour the spirit on the pulp. After standing a day or two, express the juice and spirit, filtrate it, and add the sugar and spices as before. But this method requires more spirit than the former, as it will be impossible to press it all out of the skins, and other parts of the fruit remaining, after the juice is extracted.

Of making fine and dry Ratafia from red Fruit.

Though the ratafia we have just mentioned will doubtless please the palates of many people, yet there are others who would prefer a different sort; it is therefore necessary to know how to make dry as well as sweet ratafia, if we are desirous of pleasing all sorts of palates.

Dry ratafia is prepared in the same manner as the preceding, but the ingredients are different.

An equal quantity of cherries and gooseberries are necessary in making dry or sharp ratafia: because the acidity of the gooseberries gives the requisite flavor to this sort of liquor. But, at the same time care must be taken that the gooseberries be fully ripe, for otherwise, though gooseberries are more acid before they are ripe than afterwards, yet that acidity is not the flavour desired; it is acerb and rough, and will render the flavor of the ratafia disagreeable. The same observation holds good also with regard to the cherries, they must be fully ripe, as in making the soft ratafia.

Instead of black cherries used in the composition of the preceding ratafia, mulberries should be used in this: the reason of this change is, that the juice of the black cherry is more sweet and glutinous than that of the mulberry, and therefore less fit for making the ratafia. But the mulberries must be the ripest and blackest possible, in order to give the better colour to the liquor.

More spirit and less sugar in proportion to the juice of the fruit is also required in this composition than in the foregoing; but with regard to the spices, the same quantity is generally added to both.

Recipe for making red Ratafia, fine and dry.

Take of cherries and gooseberries, of each thirty pounds, mulberries, seven pounds, raspberries, ten pounds. Pick all these fruits clean from their stalks, &c. bruise them, and let them stand twelve hours, but do not suffer them to ferment. Press out the juice, and to every pint add three ounces of sugar; when the sugar is dissolved, run it through the filtrating bag, and to every five pints of

liquor add four pints of clean proof spirit, together with the same proportion of spirit drawn from the spices in the foregoing composition.

But it may not be amiss to observe here, that different distillers use different quantities of the spirit drawn from the spices The best method, therefore is to imitate the flavor most universally approved of, which may be easily done, by adding a greater or less proportion of the spiced spirit.

Of mixed Ratafia.

By mixed ratafia is meant the juices of fruits prepared, and ready to be mixed with the spirit when called for.

Receipt for making mixed Ratafia.

Ratafia is composed of cherries and gooseberries; of these the best are to be chosen, bruised, and in that condition suffered to remain some days to ferment. The juice is then to be strained off, the quantity of sugar and brandy added, and the whole put into a cask, and close stopped. A lee or sediment will fall to the bottom of the cask, which sediment will be of great use in preserving the ratafia.

The proportion of black cherries will be large in this ratafia, because the colour, which this is greatly valued for, chiefly comes from the juice of that fruit.

The sugar must not be put in at once, because the acidness of the liquor would cause a considerable effervescence, but by a little at a time.

These instructions being observed, a ratafia of this kind may be easily made: and as the spirit is not to be mixed with it, till the ratafia is called for, a large quantity of it may be made at a small expence, when the fruits are in perfection, which cannot be done by the common methods.

Receipts for making mixed Ratafia

Take of common cherries, thoroughly ripe, four hundred and fifty pounds; gooseberries, large and ripe, two hundred and twenty-five pounds; black cherries, ripe and large, fifty pounds. Bruise these fruits, and in that condition let them continue three or four days to ferment: then press out the juice, and add one fifth part of spirit; that is, if you have two hundred and fifty pints of juice, you must add to it fifty pints of spirit. When your spirit and juice are mixed, put them into a cask, and for every pint add three ounces of sugar. By this means your ratafia will be always ready to mix with spirit

But as the proportion of spirit is but small, it will be ne-

cessary to taste your ratafia, at least, every month, lest it should ferment, and by that means lose both its flavour and colour. As soon, therefore, as you perceive the least alteration in your ratafia, more spirit must be added to stop the fermentation; and by this method it may be kept the whole year.

If you have any ratafia remaining at the end of the year, you must mix it with that just made, adding a large proportion of black cherries; because the colour in the old ratafia will not be equal to that of the new. Or you may add to your old ratafia a proper quantity of the fresh juice of black cherries, which will restore its colour, and in a great measure, its flavour too: so that if your ratafia has been well preserved, it will, when mixed with fresh juice of black cherries, be but little inferior to the new.

Of white Ratafia.

As red fruits are the basis of that called red ratafia, so, on the contrary, that made from the juices of white fruits is denominated white ratafia.

There are various kinds of ratafia made from various fruits; but I shall only give recipes for making three or four sorts, which will be sufficient for all the rest, as the method is nearly the same in all.

Recipe for making Ratafia from the Muscat, or white Frontiniac Grape.

The berries of this kind of grape are large, and grow extremely close upon the bunches, which are very long, and have commonly two shoulders; the fruit when ripe, has a rich musky flavor; but it is commonly very late in autumn before these grapes are in perfection; and the berries being so very close upon the bunches, detain the moisture in the centre, so that they often perish: to prevent which, some curious persons look over their vines, soon after the grapes are formed, and with a pair of scissars cut out all smaller ones, so as to leave the others at a moderate distance, whereby the sun and air are easily admitted, which dissipates the moisture, and prevents their perishing. There is another kind of this grape, called by some the white *Frontiniac* of *Alexandria*, and by others the *Jerusalem* muscat, which is a very large grape, and when ripe an excellent fruit. The berries of the *Jerusalem* muscat are of an oval shape, and very large. They grow very lose on the bunches, and very fleshy and firm, and when ripe, are of a greenish white, and a delicate flavor.

Either of these kind of grapes will make very fine rata-

fia ; but whichever of them are chosen, they must be picked from the stalks, and only the finest berries made use of. The stone must also be picked out ; for, if they are bruised with the berries, the fine flavour of the juice will be greatly diminished.

When you have picked the grapes from the stalks, and taken out the stones, press out the juice, and filtrate it through a flannel bag. Then add the quantity of sugar and spirit, and flavor it to your mind, with a spirit distilled from spices, in the manner explained below.

The general proportion of sugar and spirit is, to twenty pints of the juice, five pounds and an half of sugar, ten pints of spirit, and what quantity you please of the spicy spirit.

To make the spicy spirit, take of mace, one pound : nutmegs, four ounces ; spirit, three gallons, and draw off the whole in *Balneum Mariæ*.

By the same method you may make red ratafia from the red *Frontiniac ;* except that the grapes when bruised, must be suffered to ferment three or four days before the juice is pressed out ; because the colour, which resides principally in the skins of the grapes, will by that means be extracted.

The berries of the red muscat, or red *Frontiniac*, are about the size of those of the white ; but grow much thinner on the bunches. This grape, when thoroughly ripe, has the richest and highest flavor of any yet known ; but it must have a dry soil and a south aspect, otherwise it seldom ripens well. Besides the above grape, there is another, called by some red muscat of *Alexandria*, and by others, red *Jerusalem* muscat. This is not quite so late in ripening as the white muscat of *Alexandria*, above described ; and for that reason more esteemed. The berries of this kind are not quite so large as those of the white, but of the same form, and equal in goodness.

Of Ratafia from Peaches.

The ratafia made from the peach is the finest and richest flavor of any made from stoned fruits. It is, however, necessary to gather the peach when thoroughly ripe, but at the same time not to suffer it to hang too long on the tree : for, as on the one hand, it will not acquire its delicious flavor and smell till thoroughly ripe, so, on the other, it will lose both if suffered to hang on the tree after it has attained to a full maturity. Another necessary caution is to gather it in fine warm weather, and near the middle of the day, because then both the flavor and smell are in the greatest perfection.

It is also requisite to make choice of the proper sorts of peaches; for there is a remarkable difference in the flavor of these fruits. Gardeners reckon above thirty sorts of peaches; but not more than half that number are proper for making ratafia. I shall therefore give a short description of those that are most proper, that the young distiller may not be disappointed in making ratafia from peaches.

1. The early purple (called by the *French, la flourfirée hâtive.)* This tree hath smooth leaves: the flowers large and open; the fruit is large, round, and of a fine red colour; the flesh is white, but very red at the stone; very full of juice, which has a rich vinous flavor. This peach is ripe about the middle of August.

2. The large, or *French* mignon. The leaves of this tree are smooth, and the flowers large and open. The fruit is a little oblong, generally swelling out on one side, and of a fine colour. The juice is very sweet, and of a high flavor; the flesh white, but very red at the stone, which is small, and easily separates from the flesh. This peach is ripe in the middle of August.

3. The chevreuse, or belle chevreuse. This tree hath smooth leaves, and its flowers are small and contracted. The fruit is of a middling size, a little oblong, and of an elegant colour. The flesh is white, but very red at the stone, from which it separates; full of a rich sugary juice, and ripens toward the latter end of August.

4. The red magdalen, called by the *French* about *Paris*, *Magdeleine de Courson.* The leaves of this tree are deeply sawed, and the flowers large and open. The fruit is large, round, and of a fine red colour. The flesh is white, but very red at the stone, from which it separates. The juice is very sugary and of a rich flavor. It is ripe the latter end of August.

5. *Smith's Newington.* This tree hath sawed leaves and large open flowers. The fruit is of a middling size, and of a fine red next the sun. The flesh is very firm and white, but very red at the stone, to which it closely adheres. It has a rich sugary juice, and is ripe the latter end of August.

6. The chancellor. The leaves of this tree are smooth and the flowers small and contracted. The fruit is shaped somewhat like the belle chevreuse, but rounder. The flesh is white and melting, and separates from the stone, where it is of a fine red colour. The skin is very thin, and the juice remarkably rich. It ripens about the end of August.

7. The bellegarde; or, as the French call it, the *gallande.* This tree hath narrow leaves, and small contracted flowers. The fruit is very large and round, and of a deep

purple colour on the side exposed to the sun. The flesh is white, melting and separates from the stone, where it is of a deep red colour. The juice is very rich. This peach is, ripe about the beginning of September.

8. The bourdine. The leaves of this tree are smooth, and the flowers small and contracted. The fruit is large, round, and of a fine red colour next the sun. The flesh is white, melting, and separates from the stone, where it is of a fine red colour. The juice is vinous and rich. It is ripe the beginning of September, and greatly esteemed by the curious.

9. The Lisle; or, as the French call it, *la pefetite violette hâtive*. This tree hath smooth leaves, and small contracted flowers. The fruit is of a middle size, and next the sun of a fine violet colour. The flesh is of a pale yellow, melting, full of a rich vinous juice; but adheres to the stone, where it is very red. This fruit is ripe the beginning of September.

10. The old *Newington*. The leaves of this tree are sawed, and the flowers large and open. The fruit is fair, large, and of a beautiful colour next the sun. The flesh is white, melting, and closely adheres to the stone, where it is of a deep red colour. The juice is very rich and vinous. It ripens about the middle of September.

11. The rambouillet, commonly called the rambullion. This tree hath smooth leaves, and large open flowers. The fruit is of a middling size, rather round than long, deeply divided by a furrow in the middle; of a fine red colour next the sun, but of a light yellow next the wall. The flesh is melting, of a bright yellow colour, except near the stone, from which it separates, where it is of a deep red. The juice is rich and of a vinous flavor. This fruit ripens about the middle of September.

12. The pourprée, or, as the French generally call it, *Pourprée tardive*, the late purple. The leaves of this tree are very large, and sawed, the shoots strong, and the flowers small and contracted. The flesh, except near the stone, from which it separates, and where it is red, is white, melting, and of a rich sugary juice. It is not ripe till near the end of September.

13. The nevette. The leaves of this tree are sawed, and the flowers small and contracted. The fruit is large, somewhat longer than round, of a bright red colour next the sun, and of a pale yellow on the other. The flesh is melting, full of a rich juice, and very red at the stone, from which it separates. It ripens about the middle of September, and is esteemed one of the best peaches.

14. The royal. This tree hath smooth leaves, and small contracted flowers. The fruit is large, round, and of a deep red on the side exposed to the sun, but of a pale

yellow on the other. The flesh is white, melting, and full of a rich juice, of a white colour, except near the stone, from which it separates where it is of a deep red. This fruit is ripe about the middle of September.

15. The monstrous pavy of pomponne. The leaves of this tree are smooth, the flowers large and open. The fruit is very large and round, many times fourteen inches in circumference. The flesh is white, melting, and closely adheres to the stone, where it is of a deep red colour.—The side next the sun is a beautiful red, and the other of a pale flesh colour. It ripens about the end of October, and when the autumn is warm, is an excellent peach.

The above description of the different kinds of peaches proper for making ratafia, will be of use to the young artist, as the fine flavor of this liquor in a great measure depends on a proper choice of the fruits used in the composition; and if the instructions relating to the perfections and ripeness of these fruits are observed, an excellent cordial may be easily made in the following manner:

Take your peaches, bruise them, and instantly strain out their juice through a piece of strong linen. In this juice, without any mixture of water, dissolve your sugar; and when the sugar is melted, add the quantity of spirit. No spices must be used in this ratafia, the fine flavor of the peach being far preferable to all spices in the world. The quantity of either the sugar or spirit may be augmented or lessened according to your own judgement, or in proportion to the price of your ratafia.

As soon as the spirit is added to the dulcified juice of the peaches, the whole must be filtrated through a flannel bag, put into bottles close stopped; for the fine flavor of the peach will soon be lost, unless the bottles are very well corked. Some also cover the cork with sealing-wax, which is not a bad caution.

If you would have your ratafia of a bright red colour, you must let your bruised peaches ferment a day or two; by which means the colour of the skin, and that of the flesh near the stone, will be extracted, and give your ratafia the colour desired.

Of Orange-flower Ratafia.

The orange-flowers used in making ratafia should be large, in their full perfection, gathered before the rising of the sun, and carefully picked from their stalks, &c.—Some blanch the orange-flowers, by putting them into a small quantity of water, and boiling them a few minutes over the fire. But by this method the most volatile parts of the flower are evaporated, by which the ratafia will lose much of its delicate flavor.

The best way, therefore, is to use the orange-flowers without any previous boiling.

Recipe for making ten gallons of Orange-flower Ratafia.

Take of orange-flowers fresh gathered and clean picked from their stalks, &c. five pounds, and infuse them six days in five gallons of clean proof spirit. Dissolve fourteen pounds of sugar in five gallons of water; and after straining the spirit from the flowers, mix it with the syrup, and filtrate the whole through a flannel bag.

Some instead of common water use the orange-flower water; but it will be necessary in pursuing that method to take care that the water be fresh made, and very fragrant; for, otherwise, instead of improving, you will greatly injure the fine flavor of your ratafia.

The foreign distillers keep two sorts of orange-flower ratafia; one they call *single*, and the other *double*. The former is made according to the above recipe; but in making the latter, they use double the quantity of orange-flowers, and considerably augment the proportion of sugar. It will be needless to give a recipe for making that sort of ratafia, which they call double, as the process is exactly the same.

Ratafia of Portugal Orange.

Ratafia may be made from any sort of orange, but that of the *Portugal* orange is reckoned the best.

The oranges must be chosen fair, large, and ripe; and the outer or yellow peel be carefully taken off The juice of the oranges must be then pressed out, dulcified with sugar: and mixed with the spirit: after which the outer rinds are to be added, and after a proper infusion, the whole filtrated through a flannel bag.

Recipe for making three gallons of Portugal Orange Ratafia

Take of the juice of *Portugal* oranges, two gallons; clean rectified spirit, one gallon; four pounds of sugar; and the peel of ten oranges. Let the whole infuse a fortnight, and then filter the liquor through a flannel bag.

Some instead of infusing the peel as directed in the above recipe, put the peel into the spirit, and distil it in *Balneum Mariæ*; after which they add the spirit to the dulcified orange juice, and filtrate it as before.

The foregoing recipes for making ratafia from different fruits, &c. will be sufficient to instruct the young distiller in the method necessary to be pursued for making cordials of this kind; for it would be tedious to give formulas for

making all kinds of ratafia kept by different distillers. The method in all is nearly the same; and the proportion of sugar and spirit may be easily discovered by a few experiments.

Article IX.

Of Geneva.

There was formerly kept in apothecaries shops a distilled spirituous water of juniper; but the vulgar being fond of it as a dram, the distillers supplanted the apothecaries and sold it under the name of Geneva. The common sort however, is not made from juniper-berries, as it ought to be, but from oil of turpentine; the method of which we shall give in the sequel of this chapter.

Juniper-berries are a roundish fruit, of the size of a pea. They wither and wrinkle in the drying, and we meet with them variously corrugated, and usually covered with a bluish resinous dust when fresh. They should be chosen fresh, plump, full of pulp, and of a strong taste and smell. Some of the juniper shrubs are males, some females of the same species; the male shrubs produce in April or May a small kind of juli with spices on them, very large, and full of farina; the females produce none of the juli, but only the berries, which do not ripen till the second year, and then do not immediately fall off, so that it is no uncommon thing to see three sets of berries, or the berries of three different years at once on the same tree.

If you make use of American berries, let them be fully ripe before they are gathered: and in order to preserve them, spread them very thin on a boarded floor, leaving the windows and doors open, and turn them once a day till they are dry; after which pack them up in barrels, so that no air may come to them they will keep good all the year. Some, when they are dry, throw them altogether in a heap in a corner of the room, where they continue till wanted for use: but the berries will not keep so well by this method, as by being packed in casks, they are subject to contract a mouldiness, which will give a taste to the goods greatly to their disadvantage.

Some distillers, as soon as their berries are gathered, put them into casks, and cover them with spirits of wine by this method the berries are indeed well preserved without any danger of contracting an ill smell, which they are very apt to do by the other methods, unless the greatest care be taken; but then it must be remembered, that the spirit will extract great part of their essential oil, in which their virtues consists, and consequently the berries themselves will be rendered of little value. If,

therefore, you preserve your berries in this manner, you should put into each cask or jar, only the quantity you use for one charge of your still; and when you have occasion to use them, put both the spirits and berries into your alembic.

Thus your berries will be finely preserved, without any loss either of their essential oil, or the spirits made use of to preserve them.

Receipe for making ten gallons of Geneva.

Take of juniper berries, three pounds; proof spirit, ten gallons; water. four gallons Draw off by a gentle fire till the faints begin to rise, and make up your goods to the strength required with clean water.

The distillers generally call those goods which are made up proof by the name of Royal Geneva; for the common sort is much below proof, ten gallons of spirit being sufficient for fifteen gallons of Geneva. Nay, what is generally sold at the common alehouses is made in the following manner.

Take of the ordinary malt spirits, ten gallons; oil of terpentine, two ounces; bay salt, three handfuls. Draw off by a gentle fire till the faints begin to raise, and make up your goods to the strength required with clean water.

In this manner is the common geneva made, and it is surprising that people should accustom themselves to drink it for pleasure.

There is a sort of this liquor called *Holland's* geneva, from its being imported from *Holland*, which is greatly esteemed.

These ingredients used by the *Dutch* are, however, the same as those given in the first recipe of this article, only instead of malt spirit they use *French* brandy. In the first part of this Treatise we have sufficiently shewn the nature of *French* brandy, and in what its excellence consists; and, also, that by the help of a clean spirit, cordial waters may be made with the same goodness as those drawn with *French* brandy. If, therefore the distiller be careful in distilling and rectifying his malt spirit, he may make geneva equal to that of the *Dutch*, provided it be kept to a proper age; for all spirituous liquors contract a softness and mellowness by age, impossible to be imitated by art.

Article X.

Of Cherry-Brandy.

This liquor is greatly called for in the country; and is made different ways. Some press out the juice of the

cherries, and having dulcified it with sugar, add as much spirit to it as the goods will bear, or the price it is intended to be sold for. But the common method is to put the cherries clean picked into a cask, with a proper quantity of proof spirit, and after standing eighteen or twenty days, the goods are drawn off into another cask for sale, and about two thirds of the first quantity of spirits poured into the cask upon the cherries. This is suffered to stand about a month to extract the whole virtue from the cherries, after which it is drawn off as before ; and the cherries pressed to take out the spirit they had absorbed. The proportion of cherries and spirit is not very nicely observed ; the general rule is to let the cask be about half filled with cherries, and then filled up with proof spirits. Some add to every twenty gallons of spirit, half an ounce of cinnamon, an ounce of cloves, and about three pounds of sugar, by which the flavor of the goods is considerably increased. But in order to save expences, not only the spices and sugar are generally omitted, but also a great part of the cherries, and the deficiency supplied by the juice of elder-berries. Your own reason, therefore, and the price you can sell your goods for, must direct you in the choice of your ingredients.

By the same method you may make raspberry brandy ; and if the colour of the goods be not deep enough, it may be improved by an addition of cherry-brandy.

THE

COMPLETE

FAMILY BREWER;

OR, THE

BEST METHOD OF BREWING OR MAKING

ANY QUANTITY OF

GOOD STRONG ALE AND SMALL BEER,

IN THE GREATEST PERFECTION,

FOR THE USE OF PRIVATE FAMILIES;

From a Peck of Malt to 60 Bushels.

THIS Treatise being intended principally for the use of private families, it will be necessary to begin with Directions.

How to choose good Malt.

Malt is chosen by its sweet smell, mellow taste, full flower, round body and thin skin. There are two sorts in general used, the pale and the brown; the former is most used in gentlemen's houses, and private families; the latter in public brew-houses, as seeming to go further, and make the liquor high coloured. Others again mix one third brown with two thirds pale; but this depends upon the liking of the drinkers. The sweetest Malt is that which is dryed with coak or cinders.

In grinding it, see that the mill be clean from dust, cobwebs, &c. and set so as to crush every grain without grinding it to powder; for you had better have some small grains slip through untouched, than have the whole ground too small, which will cause it to take together, so that you cannot get the goodness out of it.

Of Hops.

Hops are chosen by their bright green colour, sweet smell, and clamminess, when rubbed between the hands.

Of water for Brewing.

Water out of rivers or rivulets is the best, except polluted by the melting of snow or land water from clay or

ploughed lands. Snow water will take near one fifth part more of malt to make the beer good. If you have no river water, a pond that has a bottom not over muddy, and is fed by a spring will do; for the sun will soften and rarefy it. Very hard water drawn from a deep well, into a wide cistern or reservoir, and exposed to the air or sun, in two or three days has been brewed with success, by the addition of malt. Rain water comes next to river for brewing, in short, all water that will raise a latherwith soap, is good for brewing.

Of the brewing vessels.

To a copper that holds 36 gallons, the mash tun ought to be at least big enough to contain six bushels of malt, and the copper of liquor, and room for mashing or stirring it: The under back, coolers and working tuns, may be rather fitted for the convenience of the room, than to a particular size; for if one vessel be not sufficient to hold your liquor, you may take a second.

Of cleaning and sweetening casks and Brewing vessels.

If a cask, after the beer is drank out, be well stopt to keep out the air, and the lees remaining in it till you want to use it again, you will need only to scald it well, and take care of the hoops before you fill it; but if air gets into a foul empty cask, it will contract an ill scent in spite of scalding. A handful of bruised pepper boiled in the water you scald with, will take out a little musty smell; but the surest way is to take out the head of the cask, and let the cooper shave and burn it a little, and then scald it for use; if you cannot conveniently have a cooper to the cask, get some stone lime, and put about three pound into a barrel, (and proportionably to smaller or bigger vessels) and put to it about six gallons of cold water, bung it up, and shake it about for some time, and afterwards scald it well: or for want of lime, take a linnen rag, and dip it in melted brimstone, and fasten one end to the bung, and light the other, and let it hang on the cask. You must give it a little air else it will not burn; but keep in as much of the sulphur as you can. Scald it afterwards, and you will find no ill smell.

If you have new casks, before you fill them, dig places in the earth, and lay them half their depth with their bung holes downward for a week; and after well scalding them, you may venture to fill them.

Another way to proceed, if your brewing vessels are tinged with any ill smell, is to take unslacked lime and water, and with an old broom scrub the vessel whilst the wa-

ter is hissing, with the lime ; and afterwards take all this lime and water away, and put fresh water into the vessel, and throw some bay or common salt into each, and let it stand a day or two ; and when you come to brew, scald your vessel, throw into them a little malt-dust or bran ; and this will not only finish their sweetening, but stop them from leaking.

But since there is so much trouble in getting vessels sweet after they have been neglected, you ought to make all thorough after brewing, and once a month to fill your vessels with fair water, and let it off again in two or three days.

Of Mashing or taking your Liquors.

Suppose you take six bushels of malt and two pounds of hops, and would make of it one barrel of strong and two barrels of small beer :

Heat your first copper of liquor for mashing, and strew over it a double handful of bran or malt, by which you will see when it begins to boil ; for it will break and curl, and then it is fit to be let off into the mash-tun, where it must remain until the steam is quite spent, and you can see your face in it, before you put in your malt ; and then you begin to mash, stirring it all the while you are putting in the malt : but keep out about half a bushel dry, which you are to strew over the rest, when you have done stirring it, which will be as soon as you have well mixed it with the liquor, and prevented it from clodding.

After the dry malt is laid on, cover your mash-tun with the sacks or cloths, to prevent losing any spirit of the malt, and let it so remain for two hours. Meanwhile have another copper of liquor hot ; and at two hours end being to let off your first wort into the under-back. Receive a pailful of the first running, and throw it again upon the malt. You will find that the malt has sucked up half of your first copper of liquor ; and therefore to make up your quantity of wort for your strong beer, you must gradually lade out of the second copper, and strew bowl after bowl over the malt, giving it time to soak through, and keeping it running by an easy stream, till you perceive you have about forty gallons, which in boiling and working will be reduced to thirty-six.

If you throw into the under-back (whilst you are letting off) about half a pound of hops, it will preserve it from foxing, or growing sour or ropy.

Your first wort being all run off, you must soften the tap of the mash-tun ; and take a copper of hot liquor for your second mashing, stirring up the malt as you did at first, and then cover it close for two hours more. Meanwhile

you fill your copper with the first wort, and boil it with the remainder of the two pounds of hops, for an hour and a half, and then lade it off into the coolers.

Contrive to receive the hops in a sieve, basket, or thin woolen bag that is sweet and clean; then immediately fill your copper with cold liquor; renew your fire under it, and begin to let off your second wort, throw a handful of hops into the under-back, for the same reason as before: you will want to lade a few bowls full of liquor over the malt to make up the copper full of second wort; and when you have enough, fasten the tap and mash a third time after the same manner, and cover it close for another two hours; and then charge your copper with the second wort, boiling it for an hour with the same hops.

By this time you may shift your first wort out of the coolers into a working-tun, to make room for the second wort to come into the coolers; and then your copper being empty, you may heat as much liquor as will serve you to lade over the malt, or, by this time, rather grains, to make up your third and last copper of wort, which must be bottled with the same hops over again; and then your coolers are discharged of your second wort, to make room for the third; and when they are both of a proper coolness, they may be put together before you set them a working.

If you would extract almost all the goodness of the malt in the first wort, by way of making October beer, you must begin to let off soon after you have mashed, (by a small stream) and throw it upon the malt again pail, after pail, for an hour, stirring it frequently in the mean time, and then let it all run off, by a very small stream. But when you have your quantity of strong beer, you must proceed in your second mashing as before.

During the time of shifting your liquors out of the copper, it is of consequence to take care to preserve it from receiving damage by burning: you should always contrive to have the fire low, or else to damp it at the time of emptying, and be very expeditious to put in fresh liquor.

Of Working the Liquor.

In this, regard must be had to the water; liquor naturally grows warm in working; therefore in mild weather it should be cold before it be set on, but a little warm in cold weather. The manner of doing it is, to put some good sweet yeast into a hand-bowl or piggin, with a little warm wort; then put the hand-bowl to swim upon the wort in the working-tun, and in a little while it will work out, and leisurely mix with the wort; and when you find the yeast is gotten hold of the wort, you must look after

it frequently ; and if you perceive it begins to heat and ferment too fast, lade some of it out into another tub ; and when grown cold, it may be put back again ; or if you reserve some of the raw wort, you may check it leisurely, by stirring it in with a hand-bowl. The cooler you work your liquor the better, provided it does but work well.

If you happen to check it too much, you may forward its working, by filling a gallon stone bottle with boiling water. Cork it close, and but the bottle into the working tun. An ounce or two of powdered ginger will have the same effect.

There are variety of methods in managing liquors whilst they are working. In the North they beat the yeast of Strong Beer and Ale once in two or three hours, for two or three days together.

This they reckon makes the drink more heady, but withal hardens it so as to be drinkable in two or three days; the last day of beating it in, (stirring the yeast and beer together) the yeast, as it rises, will thicken ; and then they take off part of the yeast, and beat in the rest, which they repeat as often as it rises thick ; and when it has done working, they tun it up, so as it may just work out of the barrel.

Others again do not beat it in at all, but let their strong drink work about two days, or till they see the ferment is over; and then they take off the top yeast, and either by a tap near the bottom, let it off fine, or else laid it out gently, to leave the sediment and yeast at the bottom. This way is proper for liquor that is to be drank soon; but if it be to keep, it will want the sediment to feed upon, and may probably grow stale, unless you make artificial lees : This you may make of a quart of brandy, and as much flour of wheat or beans as will make it into dough ; put them in lumps into the bunghole as soon as it has done working. Or else take a pound of the powder of oyster-shells, or of fat chalk, and mix it with a pound of treacle or honey, and put it in soon after it has done working.

It would add to the goodness, as well as fining of your malt liquor, if you took two quarts of wheat or beans, and make them very dry and crisp in an oven, or before the fire, and boil them in your first copper of wort. They would strain off with your hops, and might be put with them into the second copper.

Of the fining of Malt Liquors.

It is most desirable to have beer fine of itself, which it seldom fails to do in due time, if rightly brewed and worked ; but as disappointments some times happen, it will be necessary to know what to do in such cases.

Ivory shavings boiled in your wort, or hartshorn shavvings put into your cask just before you bung it down, will do much towards fining and keeping your liquor from growing stale.

Isinglass is the most common thing made use of in fining all sorts of liquors; they first beat it well with a hammer or mallet, and lay it in a pail, and then draw off about two gallons of the liquor to be fined upon it, and let it soak two or three days; and when it is soft enough to mix with the liquor, they take a wisk, and stir it about till it is all of a ferment, and white froth; and they frequently add the whites and shells of about a dozen eggs, which they beat in with it, and put all together into the cask: then with a clean mop-stick, or some such thing, stir the whole together; and then lay a cloth, or piece of paper over the bung-hole, till the ferment is over; and then bung it up close, in a few days it will fall fine.

But if you want to fine only a small quantity, take half an ounce of unslacked lime, and put it into a pint of water, and stir it well together, and let it stand for two or three hours, or till the lime settle to the bottom; then pour the water off clear, and throw away the sediment; then take half an ounce of isinglass cut small, and boil it in the lime water till it dissolves; then let it cool, and pour it into the vessel, &c.

Of recovering and preserving Malt Liquors.

Stormy weather, but especially thunder, will greatly affect your beer, and often ferments it, though brewed six months before. In such weather you should examine your cellar, and draw your vent pegs; and where you perceive it upon the fret, draw out the bung, and let it remain some days till you are sure it is quiet. 'Tis a fault to be too hasty in bunging up liquor; it had better be a weak too long out, than stop an hour too soon. Were it not for preserving the colour of the liquor, some cherry brandy thrown into the bung-hole would stop it from fetting.

If your strong beer grows flat you may quicken it by drawing off one gallon of every ten, and boil it with as many pounds of honey, as you boil gallons; and when it is cold, put it to the rest and stop it close.

A spoonful of the juice of the herb horehound, strained into a pitcher of stale beer, (and cover it close for two hours,) will make it drink like new.

Or, if you would bottle beer that is stale and flat, you should contrive to do it when you have liquor working in your tun; and leave room in every bottle to hold the quantity of a coffee cup, and fill them up with new drink out of the tun, and cork them, and in three days it will be

very brisk, and drink pleasant; but you must not propose to keep it long, for it will burst the bottles.

Of the Season for Brewing.

The season for brewing keeping beer is certainly best before Christmas, for then your malt is in perfection, not having time to contract either a musty smell, dust or weavels, (an insect that eats out the heart of the malt) and the waters are then seldom mixed with snow; and then four pounds of hops will go as far as five in the spring of the year: for you must increase in the quantity of hops as you draw towards summer. But, in short, chuse moderate weather as much as you can for brewing, and if you have of kindly cellar besides to keep your liquor in, that will not be much affected by extremity of heat or cold, you may reasonably expect great satisfaction in your brewery.

Avoid as much as possible brewing in hot weather; but if you are necessitated to brew, make no more than for present drinking, for it will not keep.

To make Elderberry-Beer, or Ebulum.

Take a hogshead of the first and strong wort, and boil in the same one bushel of picked Elderberries, full ripe; strain off, and when cold, work the liquor in the hogshead, and not in an open tun or tub; and after it has lain in the cask about a year, bottle it; and it will be a most rich drink, which they call Ebulum; and has often been preferred to port-wine, for its pleasant taste, and healthful quality.

N. B. There is no occasion for the use of sugar in this operation; because the wort has strength and sweetness enough in itself to answer that end; but there should be an infusion of hops added to the liquor, by way of preservation and relish.

Some likewise hang a small bag of bruised spices in the vessel. You may make a white Ebulum with pale malt, and white Elderberries.

To make improved and excellent wholesome Purl.

Take Roman wormwood two dozen, gention-root six pounds: calamas aromaticus (or the sweet flag root) two pounds: a pound or two of galien-gale-root; horseraddish one bunch; orange peel dried, and juniper-berries, each two pounds; seeds or kernals of sevelle oranges cleaned and dryed, two pounds

These being cut and bruised, put them into a clean butt, and start your mild brown, or pale beer upon them,

so as to fill up the vessel, about the beginning of November, and let it stand till the next season; and make it thus annually.

To brew Strong Beer.

To a barrel of beer take two bushels of wheat just cracked in the mill, and some of the flour sifted out of it; when your water is scalding hot, put it into your mash-vat, there let it stand till you can see your face in it; then put your wheat upon that, and do not stir it; let it stand two hours and a half; then let it run into a tub that has two pounds of hops in it, and a handful of rosemary flowers; and when it is all run, put it into the copper, and boil it two hours; then strain it off, setting it a cooling very thin, and setting it a working very cool; clear it very well before you put it a working; put a little yeast to it; when the yeast begins to foll, put it into your vessel, put in a pint of whole wheat, and six eggs: then stop it: Let it stand a year, and then bottle it.

A good Table-Beer may be made, by mashing again, after the preceding is drawn off; then let it stand two hours, and let that run, and mash again, and stir it as before; be sure to cover your mashing-vat well; mix the first and second running together.

To make China Ale.

To six gallons of Ale, take a quarter of a pound or more of china root, thin sliced, and a quarter of a pound of coriander seeds, bruised; hang these in a tiffany, or coarse linen bag, in the vessel, till it has done working; and let it stand fourteen days before you bottle; though the common sort vended about town, is nothing more at best than ten shilling beer, put up in small bottles, with a little spices, lemon-peel and sugar.

To make Ale, or any other liquor, that is too new, or sweet, drink stale.

To do this to the advantage of health, put to every quart of Ale, or other liquor, ten or twelve drops of the true spirit of salt, and let them be well mixed together, which they will soon do it by the subtle spirits penetrating into all parts, and have their proper effect.

To recover sour Ale.

Scrape fine chalk a pound, or as the quantity of liquor requires, more; put it into a thin bag into the Ale.

To recover liquor that is turned bad.

If any liquor be pricked or fading, put to it a little syrup of clay, and let it ferment with a little balm, which will recover it; and when it is well settled, bottle it up, put in a clove or two, with a lump of loaf sugar.

Directions for Bottling.

You must have firm corks, boiled in wort, or grounds of beer; fill within an inch of the cork's reach, and beat it in with a mallet; then, with a small brass wire, bind the neck of the bottle, bring up the ends, and twist them over with a pair of pinchers.

To make a quarter of a hogshead of Ale, and a hogshead of Beer, of coaked malt.

Take five strike of malt not ground too small: put in some boiling water, to cover the bottom of your mashing-vat, before you put in your malt: mash it with more boiling water, putting in your malt at several times, that it may be sure to be all wet alike, cover it with a peck of wheat bran; then let it stand thus mashed four hours then draw off three gallons of wort, and pour it upon that you have mashed; so let it stand half an hour more, till it runs clear then draw off all that will run, and take two quarts of it to begin to work up with the balm, which must be about a pint and a half; put in the two quarts of wort at three times to the balm; you need not stir it till you begin to put in the boiled wort.

You will not have enough to fill your vessel at first; wherefore you must pour on more boiling water, immediately after the other has done running, till you have enough to fill a quarter of a hogshead; and then pour on water for a hogshead of beer.

As soon as the ale wort has run off put a third part into the boiler: when it boils up, take off the scum, which you may put upon the grains for the small beer: when it is skummed, put in a pound and a half of hops, having first sifted out the seeds, then put in all the wort, and let it boil two hours and a half, afterwards strain into two coolers, and let it stand to cool and settle, then put it to cool a little at a time, to the balm, and two quarts of wort, and beat it well together: every time you put the wort in, be sure you keep the settling out.

Suppose you brew early on Thursday morning, you may tun it at nine or ten on Saturday morning.

Do not fill your vessel quite full, but keep about three

gallons to put in, when it has worked twenty-four hours, which will make it work again.

As soon as it hath done working, stop it up ; put the drink as cool as you can together, thus it will work well.

To make Treacle-Beer.

Boil two quarts of water, put into it one pound of treacle or molasses, stir them together till they are well mixed; then put six or eight quarts of cold water to it, and about a tea cup full of yeast or balm, put it up in a clean cask or stein, cover it over with a coarse cloth, two or three times double, it will be fit to drink in two or three days.

The second and third time of making, the bottom of the first Beer will do instead of yeast.

If you make a large quantity, or intend it for keeping, you must put in a handful of hops and another of malt, for it to feed on, and when done working, stop it up close.

The above is the best and cheapest way of making treacle Beer, though some people add raisins, bran, wormwood, spices, such Fruit, &c. as are in season, but that is just as you fancy.

Indeed many pleasant, cheap, and wholesome drinks may be made from Fruits, &c. if they are bruised and boiled in water, before the Treacle is added.

ON TANNING.

TANNING is the art of converting the raw skins of animals, into leather. As the methods of tanning in general use have been found tedious and expensive in their operation, various schemes, at different times, have been suggested to shorten the process and lessen the expence.

Much light has been thrown by modern chemists upon the theory of Tanning. M Seguin, in France has particularly distinguished himself by his researches on this subject, and much improved the art in his country.

A few years since W. Lesmond obtained a patent for practising Seguins method in England. He obtained the Tanning principle by digesting oak bark, or other proper materials, in cold water, in an apparatus nearly similar to that used in the salt-petre works That is to say, the water which has remained upon the powdered bark a certain time in one vessel, is drawn off by a cock, and poured upon fresh tan. This is again to be drawn off. and poured upon fresh tan ; and in this way the process to be continued to the fifth vessel. The liquor is then highly coloured, and marks from six to eight degrees upon the hydrometer for salts. This he calls the tanning lixivium. The criterion for ascertaining its strength, is the quantity of the solution of gelatine which a given quantity of it will precipitate. Isinglass is used for this purpose, being entirely composed of galatine. And here it may be observed, that this is the mode of ascertaining the quantity of tanning principle in any vegetable substance, and consequently how far they may be used as a substitute for oak bark.

The hides, after being prepared in the usual way, are immersed for some hours, in a weak tanning lixivium of only one or two degrees : to obtain which the latter portions of the infusions are set apart, or else some of that which has been partly exhausted by use in tanning. The hides are then to be put into a stronger lixivium, where, in a few days, they will be brought to the same degree of saturation with the liquor in which they are immersed. When the hides are by this means completely saturated, that is to say, perfectly tanned, they are to be removed, and slowly dried in the shade.

The length of time necessary to tan leather completely, according to the old process, is a very great inconvenience; and there is no doubt that it may be much shortened by following the new method. It has been found, however, that the leather so tanned, has not been so durable as that which has been formed by a slower process.

The public is much indebted to Mr. Davy, professor of chemistry in the Royal Institution, for the attention he has paid to the subject. From his excellent paper "on the constitutent parts of astringent vegetables," in the philosophical transactions, we present the reader with the following extract :-

"The different qualities of leather made with the same kind of skin, seem to depend very much upon the different quantities of extractive matter it contains. The leather obtained by means of an infusion of galls, is generally found harder, and more liable to crack, than the leather obtained from an infusion of bark; and in all cases it contains a much larger proportion of tannin, and a smaller proportion of extractive matter.

"When skins are very slowly tanned in weak solutions of the barks, or of catechu, it combines with a considerable proportion of extractive matter; and in these cases, though the increase of weight of the skin is comparatively small, yet it is rendered perfectly insoluble in water, and is found soft, and at the same time strong. The saturated astringent infusions of bark contain much less of extractive matter in proportion to the tannin, than the weak infusions; and when skins are quickly tanned in them, common experience shews that it produces leather less durable than the leather slowly formed.

"Besides, in the case of quick tanning by means of infusions of bark, a quantity of vegetable extractive matter is lost to the manufacturer, which might have been made to enter into the composition of his leather by a slower process. These observations shew, that there is some foundation for the common opinion of workmen, concerning what is called in technical language, the feeding of leather in the slow method of tanning; and though the processes of the art may, in some cases, be protracted for an unnecessary length of time, yet, in general, they appear to have, by means of repeated practical experiments, arrived at a degree of perfection which cannot be very far extended by means of any elucidations of theory that have as yet been known."

It was first suspected by Sir Joseph Banks, and afterwards confirmed by the experiments of professor Davy that a substance called catechu or terra-japonica, brought from the East indies, contained a vast quantity of tannin; so much so, that it far excels every other known substance in this respect. One pound of catechu contains as much tannin as eight or ten pounds of oak bark, and would consequently tan proportionately as much more leather. It is an extract made from the wood of a species of mimosa, by decoction and subsequent evaporation.

Oak bark being a very expensive article in the process of tanning, various substances have been proposed as substitutes for it. All the parts of vegetables which are of an astringent nature, contain tannin (which may be known by their given precipitates with gelatine, insoluble in water,) and will answer this purpose. The leaves, branches, fruit, flowers, of a vast number of plants ; every part of the oak, as the leaves and acorns, oak saw-dust, and the barks of most trees contain more or less of tannin.

Of Currying.

Currying is the art of dressing cow-hides, calves-skins, &c. The principal object in this process, is to soften and suple cow and calf-skins, which are usually employed in making the upper-leathers of shoes and boots, the covers of saddles, coaches, &c. As soon as these skins are brought from the tanner's yard the currier first soaks them for some time in common water, when he takes them out, stretches them on a smooth wooden horse, scrapes off with a paring-knife all the superfluous flesh, and immerses them again. They are next put on a wet hurdle, and trampled with the heels till they become soft and pliant, when they are steeped in train-oil, and afterwards spread out on large tables, and their ends tightly secured. Then by means of a pummel (an instrument consisting of a thick piece of wood, the lower side of which is full of furrows or teeth, crossing each other,) the currier folds, squares, and moves the skins in various directions to render them supple. This operation is properly called currying ; and, with a few immaterial exceptions, is that now generally followed.

After the skins are thus dressed, they are coloured, black, white, red, green, &c. which process is performed either on the flesh or grain side. When a skin is to be made white, rub it with chalk, or white-lead, and afterwards with pumice stone. But when a black colour is wanted, the skin must be first oiled and dried, then passed over a puff, dipped in water impregnated with iron, when it is immersed in another water prepared with soot, vinegar, and gum-arabic. Thus it gradually acquires a deep dye, and the operations are repeated till it becomes of a shining black. The grain and wrinkles which contribute to the pliancy of calves and cows leather, are made by the reiterated folds given to the skin in every direction, and by the great care taken to scrape off every excrescence and hard place on both the grain and flesh sides.

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